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FLORA OF PANAMA[1]

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Part IX

FAMILY 179. RUBIACEAE—PART 1.

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Trees, *shrubs* or *herbs*, occasionally *vines*. *Leaves* simple, entire, opposite, occasionally ternate or whorled, the margin regular, usually petiolate; stipules very variable, frequently deciduous, interpetiolar or intrapetiolar, often connate, truncate or more usually with teeth or lobes, often connate to the petiole, leaflike in the Rubieae, the leaves and stipules occasionally united as a whorl of four or more segments. *Inflorescences* typically cymose, usually cymose-paniculate, small dichasia frequent, the flowers rarely solitary; bracts and bracteoles frequently deciduous. *Flowers* usually bisexual, regular, usually radially symmetrical, epigynous, usually 4–5-merous; hypanthium mostly oblong or rotund in outline, the calycine cup usually well defined, the teeth or lobes usually present, occasionally with interdental glands or with glands within the cup, the lobes equal or unequal, occasionally with one or more lobes foliaceous; corolla usually salverform, rotate or funnel shaped, the lobes usually 4–5, valvate, imbricate or twisted, occasionally cucullate; stamens usually 4–5, epipetalous or rarely free of the corolla, the anthers mostly oblong and longitudinally dehiscent, the connective occasionally produced at the apex, the filaments usually slender, rarely pubescent; ovary inferior, rarely half-inferior, usually surmounted by a conspicuous disc, 2(–4–8) loculed, the ovules 1 to many per locule, erect, pendulous or horizontal, mostly adnate to peltate placentas affixed to the median septum, the latter occasionally very thin, rarely evanescent; style simple, usually glabrous,

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After this paper went to press, several novelties in the Panamanian Rubiaceae were received. These will be published in a supplement in this journal.

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the stigmas mostly 2, occasionally capitate. *Fruits* capsular, baccate or drupaceous, occasionally a syncarp; drupes with 2 (occasionally 4–5) pyrenes, a fibrous endocarp containing single seeds per carpel; cocci when present dehiscent or indehiscent, the exocarp fleshy, deciduous or occasionally persistent; capsules dehiscing septicidally or loculicidally; berries frequently large and often with a fleshy pulp, the calyx persistent or deciduous, the ovarian disc occasionally conspicuous; seeds winged or not, rarely with a tuft of hairs, when many then usually oriented vertically or horizontally.

The Rubiaceae is the largest family of dicotyledons in Panama with about 425 species in 87 genera; some new species were encountered after this paper went to press. The family occurs at all altitudes and in all kinds of habitats, the aquatic one excepted, although it may be argued that *Lindenia rivalis* is a semi-aquatic. Few genera are cultivated horticulturally in Panama, e.g., *Ixora*. *Coffea* (coffee) is grown extensively as a food crop. Very few trees yield timber of commercial value. Few medicinally important Rubiaceae occur in Panama, *Cephaelis ipecacahuanha* being noteworthy. One species of *Cinchona*, the source of quinine bark, has been collected in Panama, and then only twice. *Cinchona pubescens*, well distributed throughout tropical South America, is native to Panama, but it has not been exploited commercially in Panama.

The Rubiaceae of the New World have been studied intensively in this century by only a few workers, in contrast, for example, to the study of African Rubiaceae. From World War I to World War II, Dr. Paul Standley dominated the study of tropical American Rubiaceae as is evident from the literature cited throughout this paper. Another worker of special note is Dr. Julian Steyermark, who was co-author with Standley of many New World species as well as authoring many of his own. Following Standley's death in 1963, Steyermark became the foremost student of tropical American Rubiaceae. In recent years he has devoted much of his time to the Rubiaceae of the Guyana Highlands and Venezuela. In recent years, several revisions or monographs of individual genera, some covering many countries and others in the form of revisions restricted to Panama, have appeared, e.g., *Bouvardia* (Blackwell); *Cephaelis* (Molina); *Crusea* (Anderson); *Galium* (Dempster); *Hamelia* (Elias); *Hoffmannia* (Dwyer); *Richardia* (Lewis); *Rondeletia* (Kirkbride).

The vast majority of Rubiaceae in Panama are trees or shrubs with the genus *Psychotria* representing almost one-quarter of the species. Subshrubs or rarely herbs like *Borreria*, *Diodia*, *Spermacoce*, etc., are particularly difficult to identify as to species.

Despite its size, species of *Psychotria* in Panama are, for the most part, easier to identify than those of the smaller genera, *Hoffmannia* and *Randia*. *Hoffmannia* is taxonomically difficult, as its stipules are soon deciduous and these rarely present on herbarium material. Added to this is the fact that the flowers and fruits show little interspecific variability. *Randia*, like *Hoffmannia* except for a few species, is poorly represented in herbaria and then usually only in fruit.

From a taxonomic viewpoint, the leaf characters which are especially noteworthy, apart from the general shape, size, and texture of the blade, as well as the apex and the base, are the number of lateral veins and whether or not these

unite submarginally to form what may be described as an undulate vein; blades which are subsessile or sessile tend to be auriculate or cordate at the base.

The stipules of Rubiaceae are of great taxonomic value, although frequently deciduous. Often it is difficult to decide whether the stipules are free or connate and this may lead to an arbitrary decision.

There is a wide range of variability in the inflorescences of the Rubiaceae. In terminal inflorescences, the occasional absence of a peduncle may bring the primary branches into a sessile position, thus creating the impression of several independent inflorescences. The capitate inflorescence, while easy to describe in terms of length or width, usually has a complex arrangement of internal bracts and bracteoles.

The flowers of the Rubiaceae, despite obvious variability in size and texture of the perianth parts, are rather uniform in general structure. Pollination mechanisms in the Rubiaceae are in need of intensive study.

The calyx usually possesses a cup which is occasionally truncate, but more usually dentate or lobate. The usual 4–5 teeth or lobes are occasionally strongly unequal, e.g., *Rondeletia* spp. Occasionally one calycine lobe dominates the others in size, e.g., *Calycophyllum*. More than a quarter of the Panamanian Rubiaceae have glands either within the cup or between the teeth or lobes, a circumstance which is in need of investigation. A spathaceous calyx is rarely encountered, e.g., *Duroia* or *Psychotria boquetensis*. In *Morinda* and *Appunia*, the hypanthiums of adjacent flowers are connate and this fusion may extend to the calycine cup.

As for the flowers of the Rubiaceae, the corolla is usually yellow or white. *Faramea* is noteworthy as the corolla is usually blue. Occasionally collectors confuse the color of subtending bracts or calycine lobes with that of the true corolla.

The corolla varies in length from 2–3 mm to more than 80 mm in *Tocoyena* and *Posoqueria*. Whether the lobes are valvate or imbricate is one of the most important taxonomic characters in the Rubiaceae at the generic level. Many species of *Psychotria* and *Cephaelis* have the lobes cucullate at the apex. The lobation of each lobe in *Joosia* is unique among the Panamanian genera. The coriaceous texture of the corolla of *Pentagonia*, *Ladenbergia* and *Simira* is noteworthy.

Stamens of the Panamanian Rubiaceae are epipetalous except for *Exostema* and *Coutarea*. The fact that the anthers of these two genera are basifixed, an uncommon situation in the Rubiaceae, suggests the possibility that these genera belong to another family. The anthers are usually oblong, although in the Spermacoceae they tend to be round. Some genera have the anthers usually produced at the apex, e.g., *Bertiera*, *Hamelia*, and *Hoffmannia* spp. *Ferdinandusa panamensis* has dimorphic or possibly trimorphic anthers. *Isertia* has anthers which are transversely locellate, the endothecium exhibiting a tigriform pattern.

The filaments are usually slender, and are terete or plano-convex. Occasionally they are crassate, e.g., in *Chione* and *Simira*. Filaments tend to be glabrous, although occasional exceptions are encountered, e.g., *Alseis* has filaments completely pubescent. The point of filament attachment is usually near the middle of the corolla tube or above the middle. Attachment position is related to the little

understood phenomenon of heterostyly in the Rubiaceae. Genera with very elongate corolla tubes tend to have the anthers on very short filaments at the orifice of the tube, e.g., *Ixora* spp., *Posoqueria*, *Lindenia*, *Tocoyena*. In describing filament attachment position, it is important that observations be made on fully developed flowers rather than buds, as the corolla tube may expand unevenly as the bud approaches anthesis. References made by Anderson (1972) in his recent monograph of *Crusea* concerning cleistogamy in the genus, as well as protandry being the rule, are noteworthy. Croat (1979) made several references to pollination mechanisms.

The dioecious condition is only occasional in Panamanian Rubiaceae: *Alibertia*, *Amaioua*, *Duroia*, *Randia* (some spp.), *Stachyarrhena*, *Borojoa*, and presumably in *Nertera*. Frequently the number of flowers in the inflorescence of one sex may differ greatly from the number characterizing the opposite sex. The ovarian disc is rarely absent; it is variable in shape, e.g., pulvinate, annular, mound shaped; it may be lobed or unlobed, glabrous or rarely pubescent. Secretory cells are not evident in sections of the disc, although Anderson (1972) observed nectar in young flowers of *Crusea*. The ovarian disc may persist in the fruit, e.g., in *Hamelia* and *Cosmibuena*. The stigma or stigmas (stigmatic lobes) are usually 2, but 3, 4, 5, or more are occasionally encountered. *Dressleriopsis* has 8 radially disposed stigmas. Stigmas often adhere in the bud and expand later.

Most ovaries are bicarpellate with numerous ovules attached to "T-shaped" or peltate placentas, the latter connate with a relatively thick median septum.

The fruits of the Rubiaceae are much more versatile at the generic level than are the flowers. They range in length from a few millimeters, e.g., *Chimarrhis*, to several centimeters in *Posoqueria*, *Randia*, *Borojoa*, *Simira*, *Tocoyena*, and *Stachyarrhena*. Only two genera in Panama have aggregate fruits: *Morinda* and *Appunia*. In some fleshy fruits the flesh is ephemeral, falling away to expose two pyrenes, e.g., *Psychotria* and *Cephaelis*. *Geophila*, however, retains the fleshy portion enclosing the two pyrenes. Most fruits are rotund or oblong. The fruits of *Chiococca*, *Coutarea*, and *Declieuxia* are strongly laterally compressed. *Galium*, *Didymaea*, and *Psychotria acuminata* have the didymous pericarps. Occasionally fruits are markedly lenticellate, e.g., *Coutarea* and *Exostema*. The calyx persists in many genera. In *Coussarea* and often in *Faramea* it is stiffly cylindrical resembling a miniature pipe organ. Occasionally the calyx, when deciduous, leaves a conspicuous annular scar, e.g., *Condaminea*, *Amaioua*, *Hamelia*, etc. In *Hamelia* the persistent ovarian disc may be prominent. Two genera which can be usually identified readily by their fruits are *Chione*, with the pericarp usually ovate-oblong, rounded at the base and tapering at the apex, and *Deppea*, being conspicuously turbinate and truncate at the apex. The achenelike alate fruits of *Allenanthus* are unique in the Rubiaceae. Rarely are fruits wider than long, most species of *Faramea* being an exception, although the common *F. occidentalis* has rotund fruits. Elongate fruits tend to be dry; those which are cigar shaped or elongate-turbinate usually suggest the tribe Cinchoneae, but are not restricted to this tribe.

Raphides are abundant in all genera of the Rubioideae except *Bertiera*. Fruits with deciduous calyx are occasional, e.g., *Cosmibuena*, *Amaioua*. Very thick-

walled fruits are found in a few genera, e.g., *Borojoa, Posoqueria, Simira, Tocoyena*. The majority of tribes have fruits with two seeds. In *Coussarea* and *Faramea* (tribe Coussareae) the seeds are solitary. Eight tribes of Panamanian Rubiaceae: Cinchoneae, Condamineae, Gardenieae, Hamelieae, Mussaendeae, Naucleeae, Oldenlandieae, and Rondeletieae, have numerous seeds. The seeds may be embedded in a gelatinous pulp. In addition to 13 genera of the Cinchoneae (Panama), the following genera have alate seeds: *Appunia, Arcytophyllum, Bathysa*, occasionally *Rondeletia* spp., *Mitracarpus, Simira*, and *Uncaria*. In *Hillia*, the body of the seed has a unipolar tuft of hairs. Capsules may dehisce septicidally, e.g., *Hillia* and *Ladenbergia*, loculicidally, e.g., *Condaminea* or *Rustia*, or circumscissilly, e.g., *Mitracarpus*. Whether the capsule dehisces from apex to base or vice versa is of paramount importance in segregating *Cinchona* from *Ladenbergia*. A few genera have the carpels separate with each carpel (mericarp) retaining the seed, e.g., *Machaonia* and *Richardia*. In *Diodia* one mericarp dehisces while the other does not. The valves of *Joosia* twist at dehiscence in conspicuous fashion. The twisting is even more exaggerated in *Lindenia*.

Illustrations for this treatment were all prepared from material at Missouri Botanical Garden (MO).

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KEYS TO THE TRIBES AND GENERA OF THE RUBIACEAE

a. Ovules more than 1 in each cell (subfamily Cinchoneae).
  b. Fruits fleshy, berrylike.
    c. Corolla lobes valvate in bud ---------- 1. Mussaendeae
    cc. Corolla lobes imbricate or contorted in bud.
      d. Corolla lobes imbricate in bud ---------- 2. Hamelieae
      dd. Corolla lobes contorted in bud ---------- 3. Gardenieae
  bb. Fruits dry, capsular.
    e. Flowers arranged in dense, compact, spherical heads ---------- 8. Naucleeae
    ee. Flowers variously disposed, never in spherical heads.
      f. Seeds winged or appendaged, vertically imbricate ---------- 4. Cinchoneae
      ff. Seeds not winged, or if winged, horizontal.
        g. Corolla lobes imbricate or contorted in bud ---------- 6. Rondeletieae
        gg. Corolla lobes valvate in bud.
          h. Seeds horizontal, usually very numerous; stipules entire or bifid; trees or shrubs ---------- 5. Condamineae
          hh. Seeds imbricate, vertical, usually few; stipules often setose-laciniate; subshrubs or herbs ---------- 7. Oldenlandieae
aa. Ovules solitary in the cells (subfamily Rubioideae, except Naucleeae).
  i. Seeds pendulous, the radicle superior; shrubs, trees, or woody vines.
    j. Flowers in compact globose heads ---------- 8. Naucleeae
    jj. Flowers never in globose heads.
      k. Stamens inserted in the throat of the corolla ---------- 9. Guettardeae
      kk. Stamens inserted at the base of the corolla tube or on a disc ---------- 10. Chiococceae
  ii. Seeds ascending, the radicle inferior; plants woody or herbaceous.
    l. Corolla lobes contorted in bud; shrubs or trees ---------- 11. Ixoreae
    l. Corolla lobes valvate in bud; habit various.
      m. Ovules basally attached; mostly shrubs or trees.
        n. Ovary 7–8 celled ---------- 14. Dressleriopsideae
        nn. Ovary 1–2 celled.
          o. Ovary 1-celled or 2-celled with a thin septum; fruits 1-seeded ---------- 12. Coussareae
          oo. Ovary 2-celled, or the cells rarely more numerous, the septum thick; fruits 2 or more seeded.
            p. Stamens usually inserted in the throat of the corolla; flowers perfect ---------- 13. Psychotrieae
            pp. Stamens usually inserted at the base of the corolla tube; flowers often unisexual ---------- 15. Anthospermeae
      mm. Ovules lateral, attached to the septum of the cell; habit various.
        q. Stipules neither foliaceous nor setiferous; trees or large shrubs; flowers congested by the hypanthium to form a dense head; fruit a syncarp, the base of the hypanthiums united ---------- 16. Morindeae
        qq. Stipules either foliaceous or setiferous; herbs or small shrubs; flowers never congested by the hypanthium; carpels free, not united.
          r. Stipules setiferous; fruit not a syncarp ---------- 17. Spermacoceae
          rr. Stipules foliaceous, similar to the leaves ---------- 18. Rubieae

1. MUSSAENDEAE

a. Leaves opposite.
  b. Leaves with intervenal areas lineolate.
    c. Petioles not tumescent or swollen.
      d. Leaves large, ¼–1 m long, often pinnatifid-lobed; calycine cup with rows of conspicuous glands within ---------- 65. *Pentagonia*
      dd. Leaves small, less than ¼ m long, not pinnatifid-lobed; calycine cup without rows of glands within ---------- 79. *Sommera*
    cc. Petioles tumescent, swollen.
  bb. Leaves with intervenal areas not lineolate ---------- 47. *Hippotis*
    e. Inflorescences terminal.
      f. Plants drying black; leaves and flowers succulent; inflorescence capitate ---------- 77. *Schradera*

ff. Plants not drying black; leaves chartaceous, occasionally stiffly so; inflorescence spreading (except subcapitate in *Amphidaysa*).
g. Stipules with conspicuous fimbriate processes ---------- 5. *Amphidaysa*
gg. Stipules without fimbriate processes.
h. Inflorescences spikelike; shrubs ---------- 42. *Gonzalagunia*
hh. Inflorescences cymose-corymbose or cymose paniculate; trees.
i. Corolla 3 or more cm long; anthers transversely locellate ---------- 49. *Isertia*
ii. Corolla less than 1.5 cm long; anthers not transversely locellate ---------- 69. *Raritebe*
ee. Inflorescences axillary.
j. Plants prostrate; fruits bright china blue ---------- 21. *Coccocypselum*
jj. Plants erect or climbing; fruits not bright china blue ---------- 76. *Sabicea*
aa. Leaves alternate ---------- 31. *Didymochlamys*

2. HAMELIEAE

a. Ovary 4–5 celled; inflorescences regularly terminal; stamens with anther connectives regularly produced at the apex.
b. Corolla lobes contorted in bud; raphides absent from leaves ---------- 10. *Bertiera*
bb. Corolla lobes imbricate in bud; raphides present in leaves ---------- 44. *Hamelia*
aa. Ovary 2–3 celled; inflorescences always axillary; stamens with the anther connective not produced at the apex (few species of *Hoffmannia* excepted).
c. Ovary 2 celled; calyx with lobes ca. 8 mm long; corolla lobes valvate ---------- 87. *Xerococcus*
cc. Ovary 2–3 celled; calyx with lobes less than 5 mm; corolla lobes imbricate ---------- 48. *Hoffmannia*

3. GARDENIEAE

a. Plants armed with spines on stems and short shoots ---------- 69. *Randia*
aa. Plants unarmed.
b. Inflorescences not spikelike; fruits not gourdlike nor on an elongate curved pedicel.
c. Flowers perfect.
d. Inflorescences with flowers several to numerous, flowers disposed in a candelabra array.
e. Flower buds curved at the apex; seeds with testa cells more than twice as long as wide ---------- 66. *Posoqueria*
ee. Flower buds not curved at the apex; seeds with testa cells less than twice as long as wide ---------- 83. *Tocoyena*
dd. Inflorescences with flowers few or solitary, not disposed in a candelabra array.
f. Leaves drying black ---------- 40. *Genipa*
ff. Leaves not drying black.
cc. Flowers unisexual.
g. Fruits oblong; terminal stipules forming a conic cap.
h. Pistillate flowers capitate or cymose; fruits not densely hirsute ---------- 4. *Amaioua*
hh. Pistillate flowers usually solitary; fruits densely hirsute ---------- 34. *Duroia*
gg. Fruits rotund; terminal stipules not forming a conic cap.
i. Fruits subtended by several persistent bracts, as large as a child's hand, superficially rough ---------- 11. *Borojoa*
ii. Fruits not subtended by several persistent bracts, to 2.5 cm wide, superficially smooth ---------- 1. *Alibertia*
bb. Staminate inflorescences spikelike; fruit a gourdlike capsule on an elongate curved pedicel ---------- 81. *Stachyarrhena*

4. CINCHONEAE

a. Vines ---------- 57. *Manettia*
aa. Shrubs or trees.
b. Stamens with anthers dimorphic or trimorphic ---------- 38. *Ferdinandusa*
bb. Stamens with anthers all alike.

c. Calyx with one lobe expanded as a blade.
d. Inflorescence cymose or corymbiform; stamens equal and exserted ..... 14. *Calycophyllum*
dd. Inflorescence spicate; stamens unequal, not exserted ..... 86. *Wittmackanthus*
cc. Calyx with all lobes similar.
e. Plants epiphytic; leaves fleshy, the lateral veins often evanescent.
f. Flowers pink or red, the corolla inflated ..... 70. *Ravnia*
ff. Flowers white or yellow.
g. Seeds winged terminally ..... 24. *Cosmibuena*
gg. Seeds with a tuft of hairs at one pole ..... 46. *Hillia*
ee. Plants terrestrial; leaves not fleshy, mostly drying papery to coriaceous, veins evident to the margin.
h. Inflorescences spikelike; stamens with filaments villose, attached at the base of the corolla tube ..... 3. *Alseis*
hh. Inflorescences various but not spikelike; stamens attached above the base of the corolla tube (except *Exostema* and *Coutarea*).
i. Corolla lobes valvate in bud.
j. Flowers 4-merous; capsule rotund ..... 13. *Bouvardia*
jj. Flowers 5-merous; capsule oblong.
k. Capsule splitting from below toward the apex ..... 20. *Cinchona*
kk. Capsule splitting from above toward the base.
l. Corolla lobes split at the apex; fruits forming 4 coiled valves ..... 51. *Joosia*
ll. Corolla lobes not lobed at the apex; fruits not forming coiled valves.
m. Capsule loculicidal ..... 56. *Macrocnemum*
mm. Capsule septicidal ..... 52. *Ladenbergia*
ii. Corolla lobes imbricate or contorted in bud.
n. Stamens conspicuously exserted; corolla not inflated; fruits neither compressed nor lenticellate ..... 36. *Exostema*
nn. Stamens not conspicuously exserted; corolla inflated; fruits compressed, strongly lenticellate ..... 26. *Coutarea*

5. CONDAMINEAE

a. Leaves glandular-punctate, the dots pellucid; anthers opening by terminal pores ..... 75. *Rustia*
aa. Leaves not glandular-punctate; anthers longitudinally dehiscent.
b. Flowers ca. 3 mm long; inflorescences axillary ..... 16. *Chimarrhias*
bb. Flowers more than 3 mm long; inflorescences terminal.
c. Calycine lobes unequal, one expanded into a large colored limb ..... 65. *Pogonopus*
cc. Calycine lobes equal or nearly so ..... 23. *Condaminea*

6. RONDELETIEAE

a. Plants woody.
b. Corolla lobes imbricate in the bud.
c. Calycine lobes unequal, often one expanded into a foliose blade.
d. Calyx with foliose blade a flaming red color ..... 85. *Warscewiczia*
dd. Calyx with foliose blade white ..... 73. *Rondeletia* (some spp.)
cc. Calycine lobes equal or nearly so.
e. Fruits large, nutlike, dehiscing septicidally; seeds winged; wood on exposure to air turning a purple red; filaments geniculate at point of attachment ..... 78. *Simira*
ee. Fruits small, dehiscing loculicidally or septicidally; seeds not winged; wood on exposure to air not turning red; filaments not geniculate at point of attachment.
f. Calycine lobes often unequal; capsule with valves not woody, not bifid at the apex ..... 73. *Rondeletia*
ff. Calycine lobes usually equal; capsule with valves woody, bifid at the apex ..... 9. *Bathysa*

bb. Corolla lobes contorted in bud.
g. Trees, terrestrial; corolla very short, the tube shorter than the lobes; fruits with valves not coiled at maturity.
h. Corolla glabrous within, 4-merous ---- 29. *Deppea*
hh. Corolla villous within, 5-merous ---- 35. *Elaeagnia*
gg. Shrubs, growing in water or on banks of streams; corolla elongate, the tube at least 5 times the length of the lobes, fruits with valves coiled at maturity ---- 54. *Lindenia*
aa. Plants herbaceous ---- 53. *Limnosipanea*

7. OLDENLANDIEAE

a. Plants herbaceous, often prostrate or subprostrate, not ericoid in habit; seeds angular or winged ---- 62. *Oldenlandia*
aa. Plants subshrubs, ericoid in habit, usually upright; seeds carinate or plano-convex ---- 8. *Arcytophyllum*

8. NAUCLEEAE

Vine with recurved spines and inflorescences axillary and globose ---- 84. *Uncaria*

9. GUETTARDEAE

a. Plants armed with rigid spines on twigs and stems.
b. Corolla lobes imbricate in bud; fruits dry, splitting into 2 indehiscent mericarps or cocci ---- 55. *Machaonia*
bb. Corolla lobes valvate in bud; fruits fleshy, not splitting into 2 indehiscent mericarps ---- 19. *Chomelia*
aa. Plants unarmed.
c. Corolla lobes imbricate in bud; leaves with intervenal areas not lineolate-striate.
d. Fruits dry, separating into 2 indehiscent mericarps or cocci; flowers not secundly disposed ---- 55. *Machaonia*
dd. Fruits fleshy; flowers secundly disposed.
e. Fruits covered with a fine feltlike pubescence ---- 43. *Guettarda*
ee. Fruits glabrate ---- 6. *Antirhea*
cc. Corolla lobes valvate in bud; leaves of some species with intervenal areas lineolate-striate ---- 19. *Chomelia*

10. CHIOCOCCEAE

a. Flowers 4-merous; fruits winged ---- 2. *Allenanthus*
aa. Flowers 5-merous; fruits not winged.
b. Corolla lobes imbricate in bud; fruits not strongly compressed; shrubs (Panama) ---- 18. *Chione*
bb. Corolla lobes valvate in bud; fruits strongly compressed; trees, shrubs, or woody vines ---- 17. *Chiococca*

11. IXOREAE

a. Bractlets connate, calyx-like or involucral; inflorescences axillary; cultivated as a tree crop ---- 22. *Coffea*
aa. Bractlets distinct, not calyx-like; inflorescences terminal; some species cultivated as ornamentals ---- 50. *Ixora*

12. COUSSAREAE

a. Ovules connate, borne on a common basal column; seeds vertical; flowers usually white ---- 25. *Coussarea*
aa. Ovules separate in a one-celled ovary; seeds horizontal; flowers often blue ---- 37. *Faramea*

13. PSYCHOTRIEAE

a. Plants prostrate, woody herbs; leaves cordate ---- 41. *Geophila*
aa. Plants erect subshrubs, shrubs or trees (except *Declieuxia*, a low woody herb [Panama]); leaves various at the base, not cordate.
b. Lobes of calyx, if present, subequal, not polymorphic at the apex.

c. Inflorescence an involucrate head, the heads solitary, sessile or pedunculate, or with 3 heads arising from a common peduncle ---------- 15. *Cephaelis*
cc. Inflorescence bracts not congested into an involucre, flowers not congested into a head.
d. Herbs; fruits laterally compressed ---------- 28. *Declieuxia*
dd. Trees, shrubs, or subshrubs, rarely epiphytes; fruits terete in cross section.
e. Seeds with an incurved ventral surface; stipules pectinate ---------- 74. *Rudgea*
ee. Seeds not with an incurved ventral surface; stipules rarely pectinate, if so, membranous.
f. Corolla tube short, to 0.7 cm long (*P. chiapensis* and *P. ostaurea* excepted), not swollen at the base; flowers white, green, or yellow; stipules of twiglets deciduous or persistent ---- 68. *Psychotria*
ff. Corolla tube elongate, more than 0.7 mm long, usually swollen at the base; flowers regularly orange and purple; stipules of twiglets regularly persistent ---------- 64. *Palicourea*
bb. Lobes of calyx unequal, polymorphic at the apex ---------- 59. *Montamans*

14. DRESSLERIOPSIDEAE

Ovary and fruit 7–8-carpellate ---------- 33. *Dressleriopsis*

15. ANTHOSPERMEAE

Plants forming prostrate mats ---------- 61. *Nertera*

16. MORINDEAE

a. Plants usually drying black, or at least fruit drying black; fruits succulent, 1 cm or more in diam. ---------- 60. *Morinda*
aa. Plants not drying black; fruits dry, less than 1 cm in diam. ---------- 7. *Appunia*

17. SPERMACOCEAE

a. Fruits with circumscissile dehiscence ---------- 58. *Mitracarpus*
aa. Fruits longitudinally dehiscent or separating into open or closed valves or cocci, lacking circumscissile dehiscence.
b. Cocci 3–5(–6) ---------- 72. *Richardia*
bb. Cocci 2.
c. Stipules with sheath with more than 3 setae; plants not fetid.
d. Cocci indehiscent.
e. Calyx lobate; cocci separating from a central axis or carpophore ---------- 27. *Crusea*
ee. Calyx dentate; cocci not separating from a central axis or carpophore ---------- 32. *Diodia*
dd. Cocci dehiscent, often only 1 of the 2 opening.
f. Cocci opening only at the base; flowers axillary ---------- 45. *Hemidiodia*
ff. Cocci opening at the apex; flowers axillary or terminal.
g. Fruits with cells similar, both dehiscent ---------- 12. *Borreria*
gg. Fruits with cells dissimilar, only one opening ---- 80. *Spermacoce*
cc. Stipules with sheath with only 3 setae; plants fetid ---------- 82. *Tabagoa*

18. RUBIEAE

a. Flowers with the hypanthium immediately subtended by an involucre of leaflike bracts ---------- 71. *Relbunium*
aa. Flowers with the hypanthium not immediately subtended by an involucre of leaflike bracts.
b. Leaves opposite ---------- 30. *Didymaea*
bb. Leaves verticillate ---------- 39. *Galium*

ARTIFICIAL KEY TO GENERA

1. Leaves alternate ..... 31. *Didymochlamys*
1′. Leaves opposite or whorled.
2. Plants armed.
3. Vines; spines recurved.
4. Inflorescence axillary, globose capitate, epedunculate ..... 84. *Uncaria*
4′. Inflorescence terminal, patulous, pedunculate ..... 69. *Randia*
3′. Shrubs or trees; spines straight.
5. Fruits dry, splitting into dehiscent mericarps or cocci ..... 55. *Machaonia*
5′. Fruits juicy, not dehiscent.
6. Fruits to 5 mm long; peduncles elongate ..... 19. *Chomelia*
6′. Fruits 10–50 mm long; peduncles absent or scarcely measurable ..... 69. *Randia*
2′. Plants not armed.
7. Fruits dry, the valves strongly coiled at maturity.
8. Shrubs, located in stream beds or on banks; flowers usually more than 5 cm long; fruits 1 cm or more wide ..... 54. *Lindenia*
8′. Trees, not located in stream beds or on banks; flowers less than 1.5 cm long; fruits ca. 0.3 cm wide ..... 51. *Joosia*
7′. Fruits dry or juicy, if valvular, the valves not strongly coiled.
9. Trees, shrubs, or subshrubs.
10. Plants epiphytic.
11. Flowers and fruits over 2 cm in length; fruits dry, capsular, cigar shaped.
12. Leaves to 5 cm wide; seeds with a tuft of hairs at each end ..... 24. *Cosmibuena*
12′. Leaves to 3.5 cm wide; seeds with a tuft of hairs at one end ..... 46. *Hillia*
11′. Flowers and fruits less than 2 cm long; fruits fleshy, sometimes appearing dry, of 4 pyrenes, round or oblong ..... 68. *Psychotria*
10′. Plants not epiphytic.
13. Plants cauliflorous, flowers arising laterally on branches ..... 69. *Randia*
13′. Plants not cauliflorous; inflorescences axillary or terminal.
14. Calyx spathaceous.
15. Flowers ca. 1 cm long; fruits of 2 pyrenes, each 1-seeded ..... 68. *Psychotria*
15′. Flowers ca. 4 cm long; fruits baccate, many-seeded ..... 47. *Hippotis*
14′. Calyx not spathaceous.
16. Leaves pellucid punctate; anthers porocidally dehiscent ..... 75. *Rustia*
16′. Leaves not pellucid punctate; anthers longitudinally dehiscent.
17. Fruits oblong and gourdlike, 5–7 cm long, on an elongate reflexed pedicel ..... 81. *Stachyarrhena*
17′. Fruits, if oblong, not gourdlike, 0.3–6.0 cm long, not on an elongate reflexed pedicel.
18. Flowers obviously secundly disposed.
19. Carpels 2.
20. Ovules attached basally, 1 per cell ..... 68. *Psychotria*
20′. Ovules axile or pendent, 1–many per cell.
21. Ovules 1 per cell, pendulous from the ovary apex ..... 19. *Chomelia*

21′. Ovules numerous, attached laterally to the placenta.
22. Fruits with a fine feltlike pubescence; shrubs; anthers included ---- 43. *Guettarda*
22′. Fruits glabrous or glabrescent; trees; anthers exserted.
23. Fruits dry ---- 3. *Alseis*
23′. Fruits fleshy ---- 6. *Antirhea*
19′. Carpels 4 ---- 44. *Hamelia*
18′. Flowers not secundly disposed but arranged opposite or alternate on the axis. (*Alseis* excepted, filaments villose).
24. Inflorescence with the flowers or flower clusters spicate.
25. Flowers (at least some) with one calycine lobe foliaceous.
26. Foliaceous lobe of calyx white or pink but not a flaming red; seeds winged ---- 86. *Wittmackanthus*
26′. Foliaceous lobe of calyx a flaming red; seeds unwinged ---- 85. *Warszewiczia*
25′. Flowers with the calycine lobes, if present, subequal.
27. Leaves chartaceous; flowers bisexual; fruits less than 2 cm long.
28. Stamens obviously exserted, attached at the base of the corolla tube, the filaments villose; fruits secundly disposed ---- 3. *Alseis*
28′. Stamens barely exserted, epipetalous, the filaments glabrous; fruits alternate or opposite on the axis ---- 42. *Gonzalagunia*
27′. Leaves coriaceous; flowers unisexual; fruits more than 5 cm long, melonlike ---- 81. *Stachyarrhena*
24′. Inflorescences with the flowers paniculate, racemiform, or flowers densely aggregated in leaf axils or occasionally solitary, not spicate.
29. Corolla inflated, medianly campanulate, urceolate or ellipsoid.
30. Corolla 4–6 cm long.
31. Shrubs sprawling; leaves coriaceous when dry, the lateral veins scarcely evident or evanescent; inflorescences with the flowers 1–3, pink or red; anthers versatile; fruits cigar shaped, scarcely lenticellate ---- 70. *Ravnia*
31′. Shrubs upright; leaves chartaceous, the lateral veins conspicuous; inflorescence with the flowers more than 3, white; anthers basifixed; fruits purse shaped, strongly lenticellate ---- 26. *Coutarea*
30′. Corolla less than 4 cm long.
32. Anthers dimorphic or trimorphic; leaves and flowers not drying black ---- 38. *Ferdinandusa*
32′. Anthers all alike; leaves and flowers drying black ---- 77. *Schradera*
29′. Corolla tubular or scarcely inflated.
33. Calyx with one or all of the lobes foliaceous.
34. Leaves with the intervenal areas not lineolate-striate, only one or no calycine lobe in some flowers foliaceous.
35. Expanded calycine lobe flaming red, 2–3 times longer than wide ---- 85. *Warszewiczia*
35′. Expanded calycine lobe white, pink, or dull red, less than 2 times longer than wide.
36. Expanded calycine lobe to 1.5 cm wide; fruits globose ---- 73. *Rondeletia*
36′. Expanded calycine lobe 1.5–6.0 cm wide; fruits oblong.
37. Inflorescence paniculate.
38. Expanded calycine lobe white; seeds winged ---- 14. *Calycophyllum*
38′. Expanded calycine lobe red; seeds not winged ---- 65. *Pogonopus*
37′. Inflorescence spicate ---- 86. *Wittmackanthus*
34′. Leaves with the intervenal areas lineolate-striate; all calycine lobes foliaceous ---- 79. *Sommera*
33′. Calyx lobes, if present, dentate or lobular, not foliaceous.
39. Flowers bisexual.

40. Corolla contorted dextrosely; fruits capsular, to 5 mm long, with 4 persistent calycine lobes ---- 29. *Deppea*
40′. Corolla contorted sinistrorsely or valvate or imbricate; fruits berrylike or of 2–4 pyrenes; if fruits capsular, usually more than 5 mm long, the often persistent calycine lobes invariably 5.
41. Flowers minute, corolla tube 2–3 mm long.
42. Ovules 2, basally attached; fruits of 2 pyrenes.
43. Flowers in involucrate heads ---- 15. *Cephaelis*
43′. Flowers in open inflorescences not in involucrate heads ---- 68. *Psychotria*
42′. Ovules numerous, attached medianly to the septum; fruits capsular ---- 16. *Chimarrhis*
41′. Flowers with the corolla tube more than 3 mm long.
44. Fruits winged, achenelike ---- 2. *Allenanthus*
44′. Fruits berrylike or capsular, the surface smooth or with distinct ridges.
45. Stamen filaments ca. 15 mm long, free from the corolla tube, attached in a ring at the base of the corolla tube ---- 36. *Exostema*
45′. Stamen filaments less than 10 mm long, epipetalous.
46. Fruits capsular.
47. Fruits 1.0–1.5 cm long, topped by a conspicuous calycine scar ---- 23. *Condaminea*
47′. Fruits usually more than 1.5 cm long; if less than 1.5 cm long, not topped by a persistent annular calycine scar.
48. Capsule splitting from below toward the apex; fruits ovoid or oblong ---- 20. *Cinchona*
48′. Capsule splitting from above toward the base; fruits cigar shaped or linear-oblong.
49. Fruits forming 4 coiled valves; corolla lobes split apically ---- 51. *Joosia*
49′. Fruits not forming coiled valves; corolla lobes not split at the apex.
50. Capsule loculicidal; flowers to 12 mm long ---- 56. *Macrocnemum*
50′. Capsule septicidal; flowers to 40 mm long ---- 52. *Ladenbergia*
46′. Fruits juicy and berrylike (except *Machaonia*), not capsular.
51. Ovary 4–5-celled; anther connective regularly produced at the apex.
52. Corolla lobes contorted in the bud; cystoliths absent ---- 10. *Bertiera*
52′. Corolla lobes imbricate in the bud; cystoliths abundant ---- 44. *Hamelia*
51′. Ovary 2- or 8-celled (*Dressleriopsis*); anthers apically obtuse or emarginate (except *Raritebe*).
53. Corolla imbricate or contorted in bud.
54. Fruits dry, splitting into mericarps or cocci; shrubs, occasionally armed ---- 55. *Machaonia*
54′. Fruits baccate, indehiscent; trees or shrubs, unarmed ---- 50. *Ixora*
53′. Corolla valvate in bud.
55. Twigs with wood on exposure to air bright red or purple; stamen filaments basally geniculate ---- 78. *Simira*
55′. Twigs with wood on exposure to air not bright red or purple; stamen filaments basally straight.
56. Flowers with the hypanthiums and calycine cups of adjacent flowers partially connate; fruit a syncarp.
57. Fruits succulent; plants usually drying black ---- 60. *Morinda*
57′. Fruits dry; plants not drying black ---- 7. *Appunia*
56′. Flowers with the hypanthiums and calycine cups of adjacent flowers free; fruits with carpels free.
58. Leaves with intervenal areas lineolate-striate.
59. Leaves pinnatifid-lobed ---- 65. *Pentagonia*
59′. Leaves not pinnatifid-lobed.

60. Leaves large, 0.35–1.00 m long ..... 65. *Pentagonia*
60′. Leaves small, 10–25 cm long.
61. Calycine lobes foliaceous, ovules numerous, the placenta lateral ..... 79. *Sommera*
61′. Calycine lobes dentate; ovules 1 per cell, pendent from the apex ..... 19. *Chomelia*
58′. Leaves with the intervenal areas not lineolate-striate.
62. Leaves cordate or auriculate at the base; carpels 8 ..... 33. *Dressleriopsis*
62′. Leaves acute, obtuse or occasionally truncate at the base; carpels 2–5(–6).
63. Fruits covered with a fine feltlike pubescence ..... 43. *Guettarda*
63′. Fruits glabrous or sparsely hairy.
64. Inflorescences axillary.
65. Ovules several per cell.
66. Calycine lobes 4.0–5.5 mm long ..... 87. *Xerococcus*
66′. Calycine lobes 0.5–1.0 mm long ..... 48. *Hoffmannia*
65′. Ovules 1 per cell.
67. Fruits baccate; bracteoles connate into a calyxlike cup; cultivated ..... 22. *Coffea*
67′. Fruits of 2 pyrenes surrounded by a soon disintegrating pulp; wild species.
68. Calycine lobes, at least some, compressed galeate at the apex ..... 59. *Montamans*
68′. Calycine lobes not galeate at the apices, acute or obtuse.
69. Flowers in involucrate heads ..... 15. *Cephaelis*
69′. Flowers in open inflorescences, not in involucrate heads ..... 68. *Psychotria*
64′. Inflorescences terminal.
70. Inflorescence disposed like a candelabrum or corymbose-capitate, the flowers upright.
71. Inflorescence corymbose-capitate; flowers red or white; corolla tube 2.0–4.5 cm long, to 1.5 mm wide; cultivated ..... 50. *Ixora*
71′. Inflorescences disposed like a candelabrum; flowers white; corolla tube 8–15 cm long, to 3 mm wide; wild species.
72. Buds with corolla lobes oriented as an eccentric mass; fruits smooth ..... 66. *Posoqueria*
72′. Buds with corolla lobes oriented centrally; fruits rough ..... 83. *Tocoyena*
70′. Inflorescences paniculate, thrysiform, globose-capitate, occasionally spiciform or racemiform, not disposed as a candelabrum, the flowers usually lax.
73. Calyx cup prominent in fruit, arising on upper ⅓ of fruit and obscuring the fruit apex ..... 9. *Bathysa*
73′. Calyx cup terminal on the fruit or absent.
74. Ovules pendulous ..... 18. *Chione*
74′. Ovules or ovule not pendulous.
75. Ovules numerous per cell.
76. Flowers small, the corolla to 3 mm long.
77. Fruits loculicidally bivalvate, the valves ultimately bifid ..... 35. *Elaegnia*
77′. Fruits septicidally valvate, the valves undivided ..... 16. *Chimarrhis*
76′. Flowers large, the corolla 4–50 mm long.
78. Anthers transversely locellate; ovary 2–6-celled ..... 49. *Isertia*

78′. Anthers not transversely locellate; ovary 2-celled ..... 34. *Raritebe*

75′. Ovules 1 per cell.

79. Fruits 1-seeded by abortion, one pyrene empty.

80. Ovules connate, attached to a basal column; flowers white; fruits longer than wide..... 25. *Coussarea*

80′. Ovules separate, collateral, basal; flowers blue, occasionally white; fruits as wide or wider than long ..... 37. *Faramea*

79′. Fruits of 2 pyrenes, each with a single seed.

81. Fruits an involucral head, the single flowers enclosed by a pair of bracteoles .. 15. *Cephaelis*

81′. Fruits not an involucral head, the single flowers not enclosed in a pair of bracteoles.

82. Stipules without teeth on the dorsal surface or margins; ovules separated by a thick septum; 2 seeds present, one in each pyrene.

83. Flowers white or yellow; corolla tube not inflated basally; stipules free, occasionally connate, usually deciduous ..... 68. *Psychotria*

83′. Flowers often orange or purple; corolla tube inflated basally; stipules usually connate, usually persistent ..... 64. *Palicourea*

82′. Stipules with subulate or prickly teeth arranged very irregularly on the dorsal surface and/or margins; ovules connate; one seed occasionally aborted ..... 74. *Rudgea*

39′. Flowers unisexual.

84. Fruits with seeds drying in a gelatinous pulp; mature fruits exceeding 1 cm in diameter.

85. Leaves usually drying black, chartaceous.

86. Fruits 4.5–8.0 cm in diameter, the most terminal stipules involucral, immediately subtending the fruit, tending to persist ..... 11. *Borojoa*

86′. Fruits to 4 cm wide, the terminal stipules not involucral, usually deciduous ..... 40. *Genipa*

85′. Leaves usually drying brown, deep red-brown or tan, chartaceous to coriaceous.

87. Leaves subcoriaceous or coriaceous.

88. Fruits densely hairy, the persistent calyx to 3 cm long ..... 47. *Hippotis*

88′. Fruits glabrous, the calyx deciduous or to 1 cm long.

89. Fruits oblong, 1.0–1.5 cm long, wrinkled on drying; corolla tube less than 1 cm long ..... 4. *Amaioua*

89′. Fruits rotund, 3–9 cm long, smooth on drying; corolla tube more than 1 cm long ..... 40. *Genipa*

87′. Leaves chartaceous.

90. Fruits rotund, drying without wrinkling; calyx present on fruit; corolla tube less than 1 cm long ..... 1. *Alibertia*

90′. Fruits oblong, obviously wrinkled on drying; calyx absent on fruit; corolla tube more than 1 cm long ..... 4. *Amaioua*

84′. Fruits with seeds drying without an obvious pulp; mature fruits not exceeding 1 cm in diameter ..... 4. *Amaioua*

9′. Vines or herbs.

91. Vines.

92. Inflorescences globose-capitate, epedunculate; plants armed ..... 84. *Uncaria*

92′. Inflorescences patulous, not globose-capitate, usually pedunculate; plants unarmed.

93. Fruits plano-convex, white, often drying white ..... 17. *Chiococca*

93′. Fruits globose, not plano-convex, orange, purple, brown, green, black, or dark blue, not drying white.

94. Leaves verticillate; stems weak; flowers white; fruits less than 4 mm long.
95. Flowers with the hypanthium immediately subtended by a whorl of 4 bracts ..... 71. *Relbunium*
95′. Flowers with the hypanthium not subtended by a whorl of bracts ..... 39. *Galium*
94′. Leaves not verticillate; stems rigid; flowers white to red; fruits 5–10 mm long.
96. Flowers white; ovary 2–5-celled; fruits baccate; leaves pubescent ..... 76. *Sabicea*
96′. Flowers white to red; ovary 2-celled; fruits capsular; leaves glabrous to glabrescent ..... 57. *Manettia*

91′. Herbs, sometimes woody.
97. Plants prostrate, creeping.
98. Leaves cordate ..... 41. *Geophila*
98′. Leaves linear, lanceolate, oblong, or ovate, not cordate.
99. Leaves small or minute, 2–14 mm long.
100. Fruits strongly didymous ..... 30. *Didymaea*
100′. Fruits not strongly didymous.
101. Leaves to 3 mm long; stipules not connate with petiole ..... 62. *Oldenlandia*
101′. Leaves 4–13 mm long; stipules connate with petiole ..... 61. *Nertera*
99′. Leaves relatively large, more than 15 mm long.
102. Leaves 1–5 cm wide, usually densely hairy; fruits fleshy.
103. Fruits strongly didymous, wider than long, glabrous or glabrescent, the calyx deciduous ..... 30. *Didymaea*
103′. Fruits subrotund, not didymous, longer than wide, pubescent, the calyx persistent ..... 21. *Coccocypselum*
102′. Leaves less than 0.5 cm wide (Panama); glabrous or glabrescent, fruits dry ..... 62. *Oldenlandia*

97′. Plants erect.
104. Plants ericoid in appearance, the leaves subcoriaceous.
105. Leaves with lateral veins inconspicuous or absent; stipules marginally erose; fruits a septicidal capsule ..... 8. *Arcytophyllum*
105′. Leaves with lateral veins obvious; stipules with margins entire; fruit a schizocarp ..... 28. *Declieuxia*
104′. Plants not ericoid in appearance, the leaves chartaceous.
106. Stipules obsolete; leaves ternate (Panama) ..... 53. *Limnosipanea*
106′. Stipules conspicuous, usually persistent (*Hoffmannia* excepted); leaves opposite or more than 3 at a node.
107. Plants with 2 basally attached ovules ..... 68. *Psychotria*
107′. Plants with ovules 2 to several, not basally attached.
108. Leaves 4–7 cm wide; stipules free of the petiole, caducous or more than 2 cm long.
109. Stipules deciduous, rarely seen; corolla tube to 1 cm long ..... 48. *Hoffmannia*
109′. Stipules present, 2–3 cm long; corolla tube 2–3 cm long ..... 5. *Amphidaysa*
108′. Leaves 1.0–3.8 cm wide; stipules connate and adnate to the petiole, to 1 cm long.
110. Fruits capsular, loculicidally bivalvate ..... 13. *Bouvardia*
110′. Fruits of 2–5 cocci.
111. Fruits circumscissile ..... 58. *Mitracarpus*
111′. Fruits longitudinally dehiscent or separating into open or closed valves or cocci; not circumscissile.
112. Cocci 3–5(–6) ..... 72. *Richardia*
112′. Cocci 2.
113. Stipular sheath with more than 3 setae.

114. Cocci indehiscent.
  115. Calyx lobate; cocci separating from a central axis or carpophore ..... 27. *Crusea*
  115′. Calyx dentate; cocci not separating from a central axis or carpophore ..... 32. *Diodia*
114′. Cocci dehiscent, often only one of the two opening.
  116. Cocci opening only at the base ..... 45. *Hemidiodia*
  116′. Cocci opening at the apex.
    117. Fruits with cells similar, both dehiscent ..... 12. *Borreria*
    117′. Fruits with cells dissimilar, only one opening ..... 80. *Spermacoce*
113′. Stipular sheath with only 3 setae ..... 82. *Tobagoa*

1. ALIBERTIA

Alibertia A. Rich. in DC., Prodr. 4: 443. 1830. TYPE: *A. edulis* (L. C. Rich.) A. Rich. in DC.

Cordiera A. Rich. in DC., Prodr. 4: 445. 1830. TYPE: *C. triflora* DC.

Shrubs or trees. *Leaves* usually coriaceous, petiolate; stipules connate at the base. *Inflorescences* terminal, the staminate flowers several, fasciculate, the pistillate flowers usually solitary. *Flowers* dioecious, usually sessile; hypanthium usually globose; calyx short or tubular, truncate or dentate; corolla tube salverform, stiffly carnose, the lobes contorted, imbricate; stamens 4–8, the anthers linear; ovary 2–8-celled, the ovules few to numerous. *Fruits* baccate, 2–8-celled, the placentas pulpy, the seeds several, large, compressed.

Alibertia is found throughout tropical America and the West Indies. It has about 35 species.

a. Leaves with secondary veins 6–15; corolla tube 1–3 cm long at anthesis, 0.5–0.8 cm wide; anthers 10–13 mm long ---------- 1. *A. edulis*
aa. Leaves with secondary veins ca. 6–19; corolla tube less than 0.8 cm long at anthesis, ca. 0.25 cm wide; anthers ca. 3 mm long ---------- 2. *A. garapatica*

1. **Alibertia edulis** (A. Rich.) A. Rich., DC., Prodr. 4: 443. 1830.—FIG. 1.

Genipa edulis A. Rich., Actes Soc. Hist. Nat. Paris 1: 107. 1792. TYPE: not seen.
Gardenia edulis (A. Rich.) Poir. in Lam., Encyc. Méth. Bot. Suppl. 2: 708. 1812.
Garapatica edulis (A. Rich.) Karst., Fl. Colombia 1: 57. 1859.
Cordiera edulis (A. Rich.) Kuntze, Rev. Gen. Pl. 279. 1891.
Sabicea edulis (A. Rich.) Seem., B. D. Jackson, Index Kew. 772. 1895.
Alibertia longistipulata Riley, Kew Bull. 1927: 122. TYPE: Panamá, *Riley 145* (K, not seen).
Alibertia panamensis Riley, Kew Bull. 1927: 123. TYPE: Panamá, *Riley 111* (K).

Shrubs or small trees, presumably dioecious, the branchlets terete or often ultimately angular, smooth, glabrous, stiffly ascending. *Leaves* narrowly oblong, falcately oblong, oblong, ovate or rarely obovate-oblong, 6–20 cm long, 2–8 cm wide, deltoid at the apex, acuminate, the acumen to 0.1 cm long, usually acute, deltoid to obtuse at the base, the costa plane to prominulous above, prominent beneath, to 0.2 cm wide, glabrous, the lateral veins 6–15, arcuate, to 2 cm apart, thin-coriaceous, lustrous, glabrous; petioles 0.5–1.0 cm long, rarely absent, glabrous; stipules connate or free, deltoid, narrowly deltoid or obovate-oblong, ca. 1.5(–2.0) cm long, 0.4–0.6 cm wide, attenuate-acuminate, the acumen often longer than the corpus, scarious, striate-venose, glabrous. *Inflorescences* of 1 to several terminal flowers subtended by broadly ovate bracts shorter than or exceeding the hypanthium in length, the buds with the apex of the corolla acute and dilated. *Flowers* sessile, unisexual, the pistillate flowers solitary, the staminate flowers in a cluster of about 8; hypanthium and calycine cup ca. 0.5 cm long, carnose, glabrous, the teeth 5(–4), deltoid to linear, to 1.8 mm long, acute to obtuse; corolla white, the tube 1–3 cm long, glabrous or villosulose outside, subcoriaceous, the lobes 4–5, imbricate, oblong, to 2 cm long, often exceeding the tube; stamens usually (4–)5(–8), the anthers narrowly oblong, 5–13 mm long, ca. 13 mm long in male flowers, ca. 5 mm long in female flowers, 0.8–1.0 mm wide, often minutely apiculate, dorsifixed, the filaments short, ca. 0.5 cm long; ovarian

FIGURE 1. *Alibertia edulis* (A. Rich.) A. Rich.—A. Flowering branch (×½). [After *Hladik 49*).]—B. Flower buds (×½). [After *Lewis et al. 1866.*]—C. Fruit (×½). [After *Lao & Holdridge 244.*]

disc doughnut-shaped, occasionally scalloped, 1.0–1.8 mm long, 0.75–1.50 mm wide, the style expanding toward the apex, the stigmas 3–4, crassate, oblong, to 1.8 mm long, the ovary 4-celled. *Fruits* terminal, sessile, solitary, rotund to compressed-rotund, to 3 cm in diam., the persistent calyx coroniform and cylindrical, to 0.5 cm long, rarely to 1 cm long, ligneous, smooth, glabrous; seeds numerous in a slimy pulp, suborbicular, ca. 0.5 cm in diam., striate.

Alibertia edulis is one of the most common shrubs in Panama. It ranges from Mexico to the Amazon Basin, although Steyermark does not include it in his Flora de Venezuela. It occurs in the West Indies. The fruits are scarcely edible. The names "Trompo" and "Trompito" refer to the fact that tops are made from the fruits. "Largartillo"; "Madroño"; "Madroño de Comer"; "Trompo"; "Trompito"; "Wild Guava."

BOCAS DEL TORO: Bocas, *Lazor et al. 2415* (MO). Columbus Island, *Wedel 32* (MO). Water Valley, *Wedel 798* (MO). Chiriquí Lagoon, *Wedel 1311* (MO). Old Bank Island, *Wedel 2009* (MO). Isla Colón, *Wedel 2474* (MO). Water Valley, *Wedel 2672* (MO). Johns Creek, *Wedel 2773* (MO). CANAL ZONE: Juan Mina, *Bartlett & Lasser 1552* (MO). Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16342* (MO). Juan Mina, *Bartlett & Lasser 16563* (MO). Cocolí, *Croat 15145* (MO). Panamerican Highway near La Chorrera, *D'Arcy 9439* (MO). Fort Kobbe, *Duke 3841, 4201, 4725* (all MO). Albrook, *Dwyer 6746* (MO); *Dwyer & Robyns 119* (MO). Empire, *Hayden 58* (MO). Fort Sherman, *Hayden 97, 107* (both MO). 6 km W of Gamboa, *Nee 7208* (MO). Road C-29, 6 km E of Gamboa, *Nee 8970* (MO). Howard Air Force Base, *Oliver & MacBryde 1894* (GH, MO, US). Balboa, *Standley 26050* (MO). Farfan, *Stern & Chambers 153* (MO). Río Cocolí, Road K-9, *Stern et al. 38* (MO). Río Indio, *Steyermark & Allen 17439* (MO). Curundú, *Tyson 1316* (MO). Chiva-Chiva Trail, *Tyson 1357* (MO). Miraflores, *White 129, 138* (both MO). Cocolí, *Wilbur et al. 12864* (MO). BARRO COLORADO ISLAND: *Aviles 23* (MO); *Croat 4226, 5167, 5358, 5574, 5724, 6006, 6128, 6142, 6328, 6429, 6878, 7390, 7454, 9249, 9512, 15263, 15397* (all MO); *Dwyer 1434, 1438, 8467* (all MO); *Ebinger 261* (MO); *Hayden 3* (MO); *Hladik 49* (MO); *Shattuck 147, 643* (both F, MO), *896, 967* (both MO); *Wetmore & Abbe 78* (MO), *78 A* (F, MO); *Woodson & Schery 977* (MO); *Zetek 4295* (F, MO). CHIRIQUÍ: Boquete, *Davidson 829* (MO); *Dwyer & Hayden 7625* (COL, MO, UC, VEN); *Kirkbride 93* (MO); *Stern et al. 1200* (MO). Puerto Armuelles, *Woodson & Schery 847* (MO). COCLÉ: Penonomé, *Dwyer 2012* (MO). 2 mi E of Río Hondo, *Gentry 2919* (MO). La Pintada, *Hunter & Allen 519* (MO). El Valle, *Lee 12* (MO). COLÓN: Salud, *Lao & Holdridge 244* (MO). Nuevo Chagres, *Lewis et al. 1866* (GH, MO). DARIÉN: Mouth of Río Yapé, *Allen 340* (MO). Quebrada Venado and Peje Swamp, *Bristan 1048* (MO). Río Canclones and Río Chucunaque, *Duke 5118* (MO). Cerro Pirri, *Duke 6584* (MO). Perrecenico River, *Duke & Bristan 236* (MO). Río Tuira, *Duke & Kirkbride 14056* (MO). Yaviza, *Gentry & Mori 13504* (MO). Between Caná and Boca de Cupé, *Stern et al. 613* (MO). LOS SANTOS: 1–2 mi W of Candelaria, *Duke A-12433* (MO). Los Asientos, *Wandehake 31* (MO). PANAMÁ: Nuevo Emperador, *Carrera 1* (MO). Cerro Campana, *Castillo 22* (MO). Río Pita, *Duke 4770* (MO). El Llano, *Duke 5520, 5824* (both MO). Isla del Rey, *Duke 9518, 10411* (both MO). Coronado Beach, *Duke 11817* (MO). Isla de La Bayoneta, *Dwyer 1736* (MO). Río Pasiga, *Gentry 2277* (MO). San José Island, *Johnston 486* (MO). Chimán, *Lewis et al. 3314* (MO, UC, VEN). Chorrera, *Rodriguez 51* (MO). Bella Vista, *Standley 25354* (MO). Isla de Espiritu Santo, *Tyson 5562* (MO). 5 mi W of Chepo, *Tyson 6725* (MO). Pacora, *Woodson et al. 743* (MO). SAN BLAS: Eslogandí, *Duke 10196* (MO). VERAGUAS: Río Cañazas headwaters, *Allen 188* (F, MO). Soná, *Allen 1073* (MO). 5 mi N of Santiago, *Blum & Tyson 622* (MO). La Mesa, *Blum & Tyson 640* (MO). 32 mi W of Santiago, *Croat 10732* (MO). San Francisco, *Dwyer 1257* (MO). Mouth of Río Concepción, *Lewis et al. 2821* (COL, DUKE, MICH, MO, UC). Laguna La Yeguda, *Luteyn 1460* (MO). Quebrada just S of Santa Fé, *Nee 8035* (MO). 5 mi E of Santiago, *Tyson et al. 4272* (MO).

2. **Alibertia garapatica** (Karst.) Schum. in Mart., Fl. Bras. 6(6): 384. 1889.

Garapatica edulis Karst., Fl. Colomb. 1: 57. 1858, not *A. edulis* A. Rich. TYPE: not seen.

Shrubs or small *trees*, to 4 m tall, the twiglets slender, often puberulent, the nodes usually swollen, the leaf scars large. *Leaves* oblong or oblong rotund, 6–15 cm long, 2.3–5.0(–6.0) cm wide, rounded or tapering widely into an obtuse or deltoid apex, acuminate, the acumen 0.5–2.0 cm long, obtuse to cuneate at the base, the lateral veins 6–10, thickly chartaceous to subcoriaceous, smooth, glabrous to sparsely golden-puberulent; petioles stiff, 0.5–1.0 cm long; stipules free?, triangular, to 3 mm long, acute, puberulent, usually deciduous. *Inflorescences* terminal, sessile or subsessile, the flowers of the female inflorescence ca. 5, occasionally solitary?, those of the male 7–10, radially disposed. *Flowers* (only male seen) ca. 1 cm long, the buds acute, the hypanthium ca. 1.5 mm long, the calycine teeth absent; corolla white, the tube cylindrical, to 8 mm long, to 2.5 mm wide, stiffly carnose, puberulent, the lobes 5, triangular, to 2.5 mm long; stamens 4(5?), narrowly oblong, ca. 3 mm long. *Fruits* subsessile or sessile, solitary, rotund or subrotund, occasionally obovate-rotund, to 2.5 cm long, slightly wider than long, drying black, minutely rugulose, glabrous, the persistent calycine cup crateriform-cylindrical, to 3 mm long.

Alibertia garapatica is known from Mexico, Panama and Colombia. The species should be studied in the field as more than one species may be involved. *Stern et al. 1719* shows 4 very immature fruits in one fructescence terminating a twiglet, while another twiglet shows 4 flowers in bud which measure about 1.2 cm in length and are not as acute as typical buds of the species. One flower dissected proved to be male with 4 subfacate sessile stamens and a fifth stamen which was abnormally plump. The 4 normal stamens measured 0.5 mm in width, with an acumen to 0.8 mm long. The abnormal stamen measured 0.8 mm in diameter. The unopened anther sacs of the normal stamens were linear and the connective laminar as one sees in the stamens of the Himantandraceae. *Allen 1616* showed a style 6.2 mm long, which was dilated basally and minutely bifid at the apex; no ovary was evident. *Dressler & Williams 3969* has leaf blades only 4.0–6.5 cm long. Several leaves of *Liesner 334* are almost rotund, being 7.0–7.5 cm long, 5–6 cm wide. *Croat 39706* (MO) from Mexico (Oaxaca) is *A. garapatica*, even though it seems out of range.

CHIRIQUÍ: Quebrada Punta de Piedra, 0–100 m, *Liesner 334* (MO). COCLÉ: Aguadulce, *McDaniel & Cooke 14762* (MO). COLÓN: Santa Rita Ridge, E of Transisthmian Highway, 300–500 m, *Gentry 6589* (MO). Santa Rita Road, *Dressler & Williams 2969* (MO). Santa Rita Road, *Mori & Kallunki 2787* (MO). HERRERA: Ocú, limestone area, *Stern et al. 33583, 33593* (both MO). PANAMÁ: Río Las Lajas, *Allen 1616* (F). Villa Rosario, International Highway, *Saldana 21* (MO). Guayabito, road to Laguna, *Smith & Smith 3463* (MO). VERAGUAS: Isla de Coiba, *Dwyer 1629* (MO).

2. ALLENANTHUS

Allenanthus Standley, Ann. Missouri Bot. Gard. 27: 344. 1940. TYPE: *A. erythrocarpus* Standley.

Trees. *Leaves* ovate elliptic, acuminate, the lateral veins few; petioles present; stipules free, ovate or rotund, cuspidate. *Inflorescences* terminal, paniculate, elongate pedunculate; bracts and bracteoles small. *Flowers* with calycine lobes 4; anthers short. *Fruits* compressed, drying red, the central seminiferous part surrounded by a thick wing.

Allenanthus is found in Costa Rica and Panama. It is among the easiest of the Rubiaceae to recognize as the fruit has the appearance of the achene of *Rumex* of the Polygonaceae.

1. **Allenanthus erythrocarpus** Standley, Ann. Missouri Bot. Gard. 27: 344. 1940. TYPE: Panamá, *Allen 1999* (MO, holotype).—FIG. 2.

Chimarrhis decurrens Steyermark, Ceiba 3: 18–19. 1952. TYPE: *Allen 3566* (F, holotype).

Trees 10(–20) m tall, the branchlets smooth, terete, rubescent, ultimately plano-compressed, glabrate, the nodes usually 4–5 cm apart. *Leaves* ovate elliptic, 7–11 cm long, 3.8–5.0 cm wide, deltoid at the apex, acuminate, the acumen to 1.5 cm long, obtuse and scarcely inequilateral at the base, the costa prominulous above, prominent beneath, the lateral veins ca. 7, arcuate, usually with one subparallel vein between 2 lateral veins, the intervenal areas mosaic-like, chartaceous, scarcely discolorous, glabrous except puberulent on the costa and the veins beneath; petioles slender, to 1.5 cm long; stipules deciduous, free,

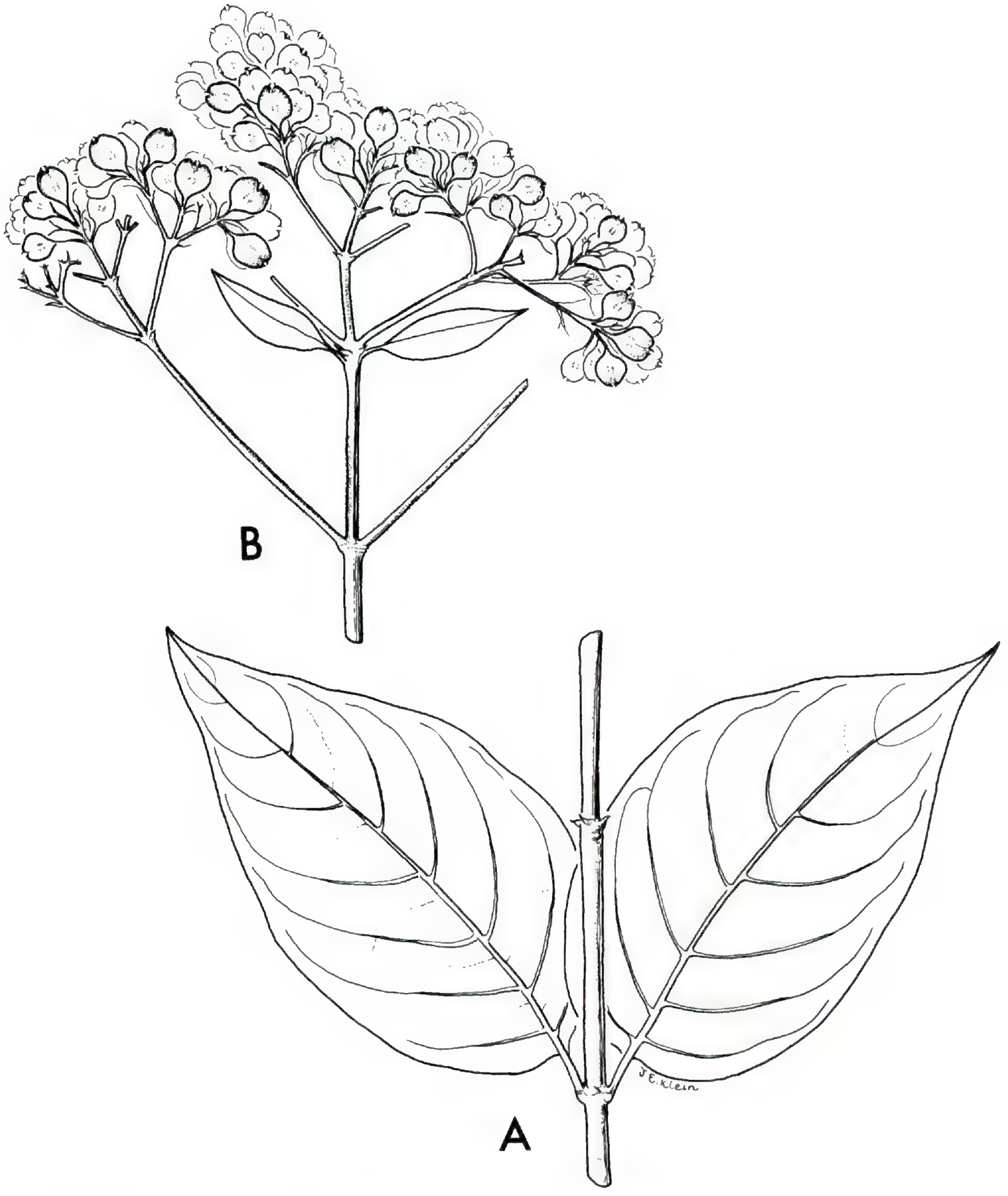

FIGURE 2. *Allenanthus erythrocarpus* Standley.—A. Branch with leaves (×.75).—B. Inflorescence (×.75). [After *Duke 5654*.]

widely ovate or compressed rotund, 3–6 mm long, abruptly cuspidate, the cusp as long as the body. *Inflorescences* terminal, solitary, paniculate, to 15 cm long, to 10 cm wide, rounded terminally, the peduncles terete, 4.0–6.5 cm long, puberulent, the branches opposite, the lowermost to 9 cm long, arcuate or strict, strongly ascending, pubescent, the hairs often present only on part of the peduncle and branches; bracts small, linear-subulate. *Flowers* with pedicels 1–5 mm long; hypanthium turbinate, glabrous, to 2 mm long; calycine lobes 4, prominent,

ovate to rotund, 0.5–0.9 mm long, glabrous; corolla tube to 4 mm long, pubescent outside, sparsely pilose within, the lobes oblong, ca. 1.5 mm long, almost as wide, rounded apically; anthers oblong, ca. 1 mm long, the filaments slightly shorter than the anthers. *Fruits* strongly compressed, ca. 8 mm long, to 6 mm wide, glabrous, appearing winged, drying red, the central seminiferous part to 2.5 mm long, 3-nerved, surrounded by a thick wing.

Allenanthus erythrocarpus is known only from Panama and Costa Rica.

COCLÉ: El Valle de Antón, *Allen 1999, 2713* (both MO), *3566* (F). PANAMÁ: Between El Llano and Río Mamoní, *Duke 5654* (MO).

3. ALSEIS

Alseis Schott in Spreng., Syst. Veg. 4(2): 4–4. 1827. TYPE: *A. floribunda* Schott.

Trees or shrubs. Stipules free, subulate. *Inflorescences* axillary and terminal, spiciform cylindrical, patulous. *Flowers* protogynous, the hypanthium obconical, the calyx 5-lobed; corolla urceolate, inflated; stamens 5, exserted, the filaments inserted at the base of the corolla; style recurved, the ovary 2-loculate, the septum thin, the ovules numerous. *Fruits* capsular, narrowly oblong, lignose, dehiscing from apex to base, 2-locular, the seeds many, narrowly fusiform.

Alseis has about 20 species ranging from Mexico through Central America to Brazil and Peru.

a. Leaves with lateral veins ca. 25; fruits before dehiscence ca. 0.2 cm wide ---- 1. *A. blackiana*
aa. Leaves with lateral veins ca. 9; fruits before dehiscence 0.4 cm wide ------- 2. *A. darienensis*

1. **Alseis blackiana** Hemsl., Diag. Pl. Nov. 30. 1879. TYPE: Panama, *Hayes 665* (K).—FIG. 3.

Trees to 75 ft tall; twigs terete, ultimately angular, the nodes well spaced or crowded, glabrous. *Leaves* obovate oblong, to 36 cm long, to 9.5 cm wide, cuneate at the apex, often cuspidate, the cusp to 1 cm long, cuneate or rarely truncate at the base, equilateral, rarely subinequilateral, the costa prominulous above, prominent beneath, diffusely villose above, the hairs weak, these short and long, occasionally aggregated in the axils, the secondary veins ca. 25, the distal veins widely arcuate, the proximal veins perpendicular, chartaceous, usually scarcely discolorous, glabrous except on the costa and the veins; petioles rigid, to 3 cm long, to 0.2 cm wide, angular, the blade decurrent on the upper part of petiole; stipules deciduous, subulate, to 1.5 cm long, ca. 0.12 cm wide, scarious, glabrous. *Inflorescences* usually several in the axils of the terminal leaves, spiciform-cylindrical, ascending, the peduncles unbranched, ascending, often falcate, shorter than or exceeding the leaves, to 12 cm long, to 0.3 cm wide, lignose, puberulent, usually lenticellate. *Flowers* with pedicels slender, pubescent, to 0.2 cm long, the bracts basal, linear, about as long as the pedicel; hypanthium narrowly cuneate cylindrical, ca. 1.2 mm long and indistinguishable from the pedicel, minutely puberulent, the calycine tube obsolete, the teeth 5, erect, or spreading, oblong deltoid, subequal, to 0.5 mm long, obtuse; corolla white, or pale yellow, inflated, urceolate, ca. 2.2 mm long, often slightly con-

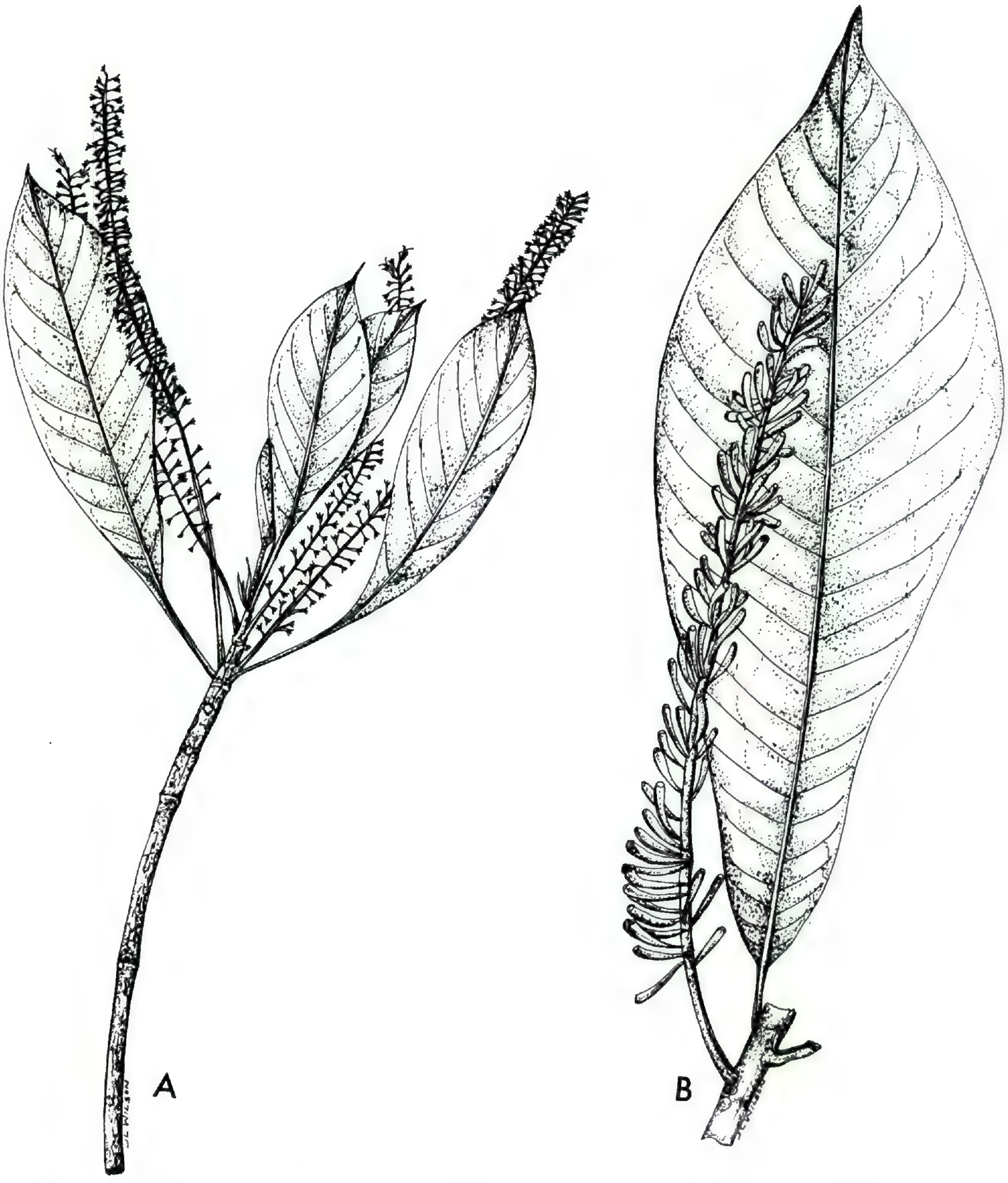

FIGURE 3. *Alseis blackiana* Hemsl.—A. Flowering branch (×½). [After *Croat 14824.*]—B. Fruiting branch (×½). [After *Croat 15560.*]

stricted medially, densely white-villose within, glabrate outside, petaloid, the orifice wide, the lobes 5, much reduced, inflexed slightly, oblong, to 0.5 mm long, obtuse; stamens 5, exserted, the anthers oblong, ca. 1 mm long, versatile, the filaments subequal, ribbonlike, ca. 6 mm long, densely villose ca. 1 mm above the base, attached at base of tube; ovarian disc prominent, mound-shaped, 2–3-lobed, 0.3–0.6 mm long, the style slender, ca. 3 mm long, expanded apically, the stigmas 2, coiled, ca. 1.3 mm long, glabrous, the ovary thin walled, the septum thin, the placentas intrusive, thick, the ovules numerous. *Fruits* with pedicels to

0.2 cm long, before dehiscence narrow-oblong, 1.2 cm long, ca. 0.2 cm wide, often falcate, penis-like or operculoid at apex, attenuate at base, lignose, drying brown, delicately longitudinally veined, puberulent and farinose, dehiscing from apex to base, the valves 2, drying lustrous yellow within; seeds numerous.

This species occurs only in Panama and Colombia. It fruits readily but despite numerous collections from Panama, it has been rarely collected in flower. In his original description Hemsley says that the stamens of the lowermost flowers are long-exserted, with those of the upper flowers included. This is not the case in the few flowering specimens examined. *Croat 14829* notes that protandry occurs in *Alseis blackiana*.

CANAL ZONE: Salamanca Hydrographic Station, Río Pequení, *Dodge et al. 17981* (MO). Pipeline Road, 4 km NW of Gamboa, *Nee 7539* (MO). Road K-9, *Stern et al. 39* (MO). BARRO COLORADO ISLAND: *Croat 5389, 6492, 8323, 9134, 9448, 9503, 10756, 14824, 14829, 16206, 15560, 16196, 16208, 16509* (all MO); *Dwyer 1439* (MO); *Foster 863* (MO); *Hayden 90* (MO); *1029* (GH, MO, US); *Hladik 415* (MO); *Shattuck 52, 822* (both MO); *Wilbur & Weaver 10792* (MO); *Zetek 5086, 5600* (both MO). DARIÉN: Río Tuquesa below Quebrada Venado, *Bristan 1087* (MO). Río Ucurgantí, *Bristan 1168* (MO). S of El Real, *Duke 5063* (MO). Line CC, *Duke 5236* (MO). Quebrada Nigua below Santa Fé, *Duke 8825* (MO). Río Pucro, below Pucro, *Duke 13120* (MO). Paya, vic Río Paya, *Stern et al. 187* (MO). El Real, Río Tuira, *Stern et al. 284* (MO). Campamento Buena Vista, Río Chucunaque, *Stern et al. 848* (MO). Cerro Piriaque, *Tyson et al. 3856* (MO).

2. **Alseis darienensis** Dwyer.[3] TYPE: Panamá, *Mori 7001* (MO, holotype).

Trees, much branching, the twiglets terete, the bark thin, scaling off, rubescent, glabrous, the nodes moderately crowded on new growth. *Leaves* ascending, oblong or lanceolate, 13 cm long, 2.0–5.5 cm wide, deltoid or acute at the apex, acuminate, the acumen widely triangular, to 1 cm long, ultimately obtuse, cuneate or acute at the base, moderately inequilateral, the costa slender, drying reddish above, somewhat prominulous beneath, the lateral veins ca. 9, arcuate, disappearing near the margin, not forming a conspicuous submarginal vein, with several smaller veins between a pair of laterals, these leaving the costa at right angles, soon disappearing, the smallest veins forming a reticulate mosaic beneath, the margin delicately callose, thin chartaceous, concolorous, beneath appressed or spreading hirsute on the costa, the hairs at right angles and lateral to the costa in and near the vein axils; petioles wiry, stiff, to 45 cm long, ca. 0.75 mm wide; stipules triangular or ovate triangular, to 7 mm long, acute, longitudinally striate, scarious, drying red, glabrous. *Inflorescences* terminal and axillary, cymose spicate, to 11 cm long, to 0.1 cm wide, rubescent, glabrous. *Flowers* (calyx only) with the calycine cup absent, the lobes 5, imbricate, oblong rotund, ca. 1 mm long, about as long as wide, obtuse, venose, puberulent marginally. *Fruits* sessile, narrowly oblong (immature), to 1.2 cm long, to 0.4 cm wide, somewhat compressed, covered with a grey indumentum; seeds membranous, drying yellow, fusiform, to 5.5 mm long.

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[3] *Alseis darienensis* Dwyer, spec. nov. *Arbores* ramulis glabris. *Folia* oblonga vel lanceolata, 4–13 cm longa, 2.0–5.5 cm lata, venis lateralibus ca. 9, tenui-chartacea subtus in costa hirsuta; petiolis ad 45 cm longis; stipulis triangularibus vel ovato-triangularibus, ad 7 mm longis, acutis glabris. *Inflorescentiae* terminales vel axillares, cymoso-spicatae, ad 11 cm longae, glabrae. *Flores* lobis calycis 5 imbricatis oblongo-rotundis, ca. 1 mm longis, obtusis. *Fructus* angusto-oblongi, ad 1.2 cm longi, conspicue griseo-puberuli.

Alseis darienensis is known only from Panama. The plant bears little resemblance to any Rubiaceae I have encountered in preparing the family for the Flora of Panama. But because of the cymose-spikelike inflorescence I have elected to place it in *Alseis*, but its placement is quite uncertain.

DARIÉN: Río Tuquesa, middle Tuquesa Mining Co. camp called Charco Peje, 250 m, *Mori 7001* (MO).

4. AMAIOUA

Amaioua Aubl., Hist. Pl. Guiane 13. 1775. TYPE: *A. guianensis* Aubl.

Trees or shrubs. *Leaves* usually crowded at the apex of the twiglets; stipules interpetiolar, connate, often irregularly cleft, finally caducous. *Inflorescences* terminal or with short lateral axes, fasciculate, capitate or corymbose, the peduncle present or absent. *Flowers* dioecious, 5–6-merous, the calycine cup tubular, the teeth reduced or conspicuous; corolla cylindrical, sericeous on the outside, the lobes contorted; stamens included (male flowers), the anthers sessile, inserted near the middle or on the lower half of the tube; female flowers with the ovary 2-celled, the ovules numerous in each cell, horizontally and biseriately arranged. *Fruits* baccate, 2-celled; seeds numerous, horizontally disposed, triangular and rounded marginally, the testa fibrous.

Amaioua occurs in Central and South America. There are about 25 species in the genus.

a. Flowers sessile or subsessile.
   b. Fruits oblong rotund, to 1.5 cm long; leaves with 6–7 lateral veins ..... 1. *A. corymbosa*
   bb. Fruits rotund, 1.8–2.2 cm long; leaves with ca. 14 lateral veins ..... 2. *A. magnicarpa*
aa. Flowers pedicellate, the pedicels to 1.5 cm long ..... 3. *A. pedicellata*

1. **Amaioua corymbosa** H.B.K., Nov. Gen. Sp. 3: 419. 1820. TYPE: Colombia, *Humboldt & Bonpland* (B, not seen, photo MO).—FIG. 4.

Gardenia hexandra Willd. ex R. & S., Syst. Veg. 5: 243. 1819. TYPE: America Merid., *Humboldt & Bonpland*, not seen.

Amaioua fagifolia Desf., Mem. Mus. Hist. Nat. 6: 14. 1820. TYPE: French Guiana, *Martin* (C, not seen, photo MO).

Amaioua guianensis Hemsl., Biol. Centr. Amer., Bot. 2: 39. 1881, not *A. guianensis* Aubl. 1775. Nomen nudum.

Shrubs or trees to 40 ft tall, the branches terete, the nodes well spaced; branchlets angular, the leaves often crowded at the apex. *Leaves* oblong, often widely so, the large blades about twice as long as wide, 9–23 cm long, 2.5–12.5 cm wide, obtuse at the apex, shortly acuminate, the acumen to 1.2 cm long, basally inequilateral or equilateral, truncate, rounded, cuneate or acute, the costa plane to prominulous above, often appressed villose proximally, appressed villose beneath, the principal secondary veins 6–7, arcuate, prominulous above, prominent beneath, subcoriaceous, usually concolorous, lightly appressed villose on costa and secondary veins, often sparsely pubescent on margins, the intervenal area glabrous; petioles to 1.5 cm long, stout, to 0.3 cm wide, often arcuate; stipules oblanceolate, 1.5–2.5 cm long, ferrugineous-sericeous outside, glabrous and glandular within. *Inflorescences* terminal, few-flowered cymes, the peduncles

FIGURE 4. *Amaioua corymbosa* H.B.K.—A. Flowering branch (×½).—B. Opened flower (×2.5). [After *Croat 16214*.]

arising in a fan, each usually unbranched, slender, stiff, angular, puberulent. *Flowers* staminate, pistillate or bisexual (functionally so?), the staminate flowers slightly larger, sessile or on pedicels shorter than the hypanthium, the buds rugous, turgid below the middle, tapering to an obtuse apex; hypanthium compressed cylindrical ca. 1 mm long, the calycine cup to 5 mm long, to 2.5 mm wide, carnose, puberulent outside, glabrous to puberulent and eglandular within, truncate, the calycine teeth 5, subulate, to 1 mm long, obtuse; corolla white, the

tube cylindrical, somewhat inflated, 5–7 mm long, 1.5 mm wide, carnose, densely white villose outside, glabrous within, the lobes 5, lanceolate, 5–7 mm long, glabrous within, minutely white-puberulent adaxially; stamens 5–6, the anthers linear oblong, 4–4.5 mm long, distinctly petaloid rostrate for 1 mm, the filaments very short, inserted near middle of tube; ovarian disc doughnut shaped, 1–2 mm long, 0.9–1.8 mm wide, 0.5 mm high, the style slender, 4–9 mm long, the stigmas 2, subulate, 0.3–0.6 mm long. *Fruits* compactly clustered, sessile, oblong rotund, to 1.5 cm long, pruniform, marcescent, sparsely sericeous, often the vestige of the calyx forming a conspicuous annular scar; seeds compressed, angulate, ca. 2 mm long, shiny red, the surface with a series of sinuous, densely packed somewhat parallel ridges.

Amaioua corymbosa ranges from Mexico to northern South America. It also occurs in Cuba. The flowers should be studied critically under field conditions. Plants have been described as dioecious, but some dissected flowers have functional anthers, a well-defined style and a pair of stigmas. The ovary is not apparent in these flowers. One collection, *Croat 11532*, has fruit more oblong in shape and does not have the appearance of a small dried prune so typical of *A. corymbosa*. The pericarp is smoother than the typical. *Croat* noted on the collection that the fruits were old, which may account for the difference in appearance.

CANAL ZONE: Fort Kobbe, near beach, *Duke 4719, 4724* (both MO). Albrook, *Dwyer & Robyns 43* (MO). Headquarters J.W.T.C., *Johnston 1574* (MO). W of Gamboa, *Nee 6772* (MO). BARRO COLORADO ISLAND: *Croat 6072, 15164, 16214* (all MO); *Foster 1337* (MO). CHIRIQUÍ: San Lorenzo, 5 m, *Lao 598* (MO). COCLÉ: La Mesa, 900–930 m, *Croat 37462* (MO). COLÓN: Salud, *Lao & Holdridge 225* (MO). DARIÉN: Pico Piriaque, *Duke 8137* (MO). Piñas, *Duke 10598* (MO). Baia de Piñas, *Stern & Chambers 192* (MO). Mouth of Río Lara, *Tyson et al. 3864* (MO). Piriaque Camp at River, *Tyson et al. 4741, 4746, 4754* (all MO). PANAMÁ: Taboga Island, *Allen 134* (BM, MO). Cerro Azul to Cerro Jefe, *Austin 24* (MO); *Blum et al. 18* (MO); *Croat 11532* (MO). Panama Viejo, *Duke 5736* (MO). San José Island, *Duke 12503* (MO). Cerro Azul to Cerro Jefe, *Dwyer 1487, 1501, 1871, 2071, 2776* (all MO), *8041* (GH, MO); *Dwyer & Gentry 10243* (MO); *Guerra 5* (MO); *Lewis et al. 268* (GH, K, MO, UC, US); *Porter et al. 4079* (MO, SCZ, US); *Reece 5* (MO). Villa Rosario, International Highway, *Saldana 21* (MO). San José Island, *Stimson 5328* (MO). Cerro Azul to Cerro Jefe, *Tyson 2089* (MO); *Tyson et al. 4061, 4314, 5381* (all MO). VERAGUAS: La Yeguada, 600 m, *Correa 2217* (MO). Isla de Coiba, *Dwyer 1629* (MO).

2. **Amaioua magnicarpa** Dwyer.[4] TYPE: Panamá, *Dwyer 9552* (MO).

Trees 6–15 m tall, the branchlets ultimately angular, the older bark cracking, ashen grey when dry, glabrous, the nodes somewhat swollen, moderately crowded. *Leaves* oblong lanceolate or oblong rotund, 11.5–17 cm long, 5–9 cm wide, deltoid to obtuse at the apex, acuminate, the acumen short, 0.4–1 cm long, obtuse or acute, often falcate, basally cuneate obtuse, scarcely inequilateral, the costa slender above, prominent beneath, the lateral veins ca. 13, at first strict, then arcuate toward the margins, the secondary veins perpendicular, subcoriaceous, concolorous, glabrous except appressed-white ciliate on the costa and veins, the minute raphides often abundant above, the margin lightly revolute; petioles to 1.5

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[4] *Amaioua magnicarpa* Dwyer, spec. nov. *Arbores* 6–15 m altae. *Folia* oblongo-lanceolata, vel oblongo-rotunda, 11.5–17 cm longa, 5–9 cm lata, venis lateralibus ca. 13 subcoriacea glabra praeter costam venasque appresso-albido-ciliatas; petiolis ad 1.5 cm longis. *Fructus* rubri et cerasini rotundi, 1.8–2.2 cm longi, apice saepe umbonati.

cm long, to 2.2 mm wide, rigid, densely appressed villose. *Flowers* not seen. *Fruits* red, cherry-like, rotund, 1.8–2.2 cm long, obtuse at the apex and base, often umbonate at the apex, puberulent, with the scars of the floral parts scarcely elevated, ca. 0.5 cm in diam.

The new species is known only from Panama. It is distinguished from the relatively common *A. corymbosa* (Willd.) H.B.K. by having much larger fruit which resemble cultivated commercial cherries.

COLÓN: Santa Rita Ridge, ca. 2000 ft, *Dwyer 9552* (MO). 9.4 km N of Goofy Lake, *Folsom et al. 1976* (MO). PANAMÁ: El Llano-Cartí 10–12 km from junction Inter-American Highway, *Mori & Kallunki 2880* (MO). El Llano-Cartí Road, 1.7 km from Inter-American Highway, *Mori, Gentry & Kallunki 4691* (MO).

3. **Amaioua pedicellata** Dwyer.[5] TYPE: Panamá, *Croat 25937* (MO, holotype; NY, isotype).

Trees 5–10 m tall, to 22 d.b.h., the branchlets terete, glabrous, the bark discolorous, the nodes well spaced. *Leaves* ovate-oblong, 6–19 cm long, 2.3–10 cm wide, widely deltoid toward the apex, attenuate-acuminate, the acumen to 1 cm long, falcate, ultimately acute, basally acute or cuneate, rarely obtuse, the costa prominulous above, prominent beneath, the lateral veins 12–14, rigid, especially prominent beneath, subcoriaceous, discolorous, above dark brown, yellow brown beneath, golden pilose with the veinlets pinnately disposed; petioles rigid, woody, to 1.5 cm long, the hairs golden, spreading or appressed; stipules not seen. *Inflorescences* terminal (in fruit) radially umbelliform, to 5 cm long, the peduncle absent, the pedicels to 1.5 cm long, rigid, puberulent. *Flowers* not seen except for a fragment of the calyx; calycine cup cylindrical, to 5 mm long, ca. 4 mm wide, truncate, ciliate without and within, the hairs golden, appressed, the teeth 5, triangular-subulate, to 0.3 mm long, these arising from a thin keel on the body of the cup. *Fruits* ovate-oblong or oblong-rotund, to 1.5 cm long, black when dry, purple brown, lightly puberulent.

Amaioua pedicellata is known only from Panama. It is readily distinguished by the long-pedicellate fruits and presumably flowers disposed in the form of an umbel.

COCLÉ: Lumber camp at Alto Calvaro, 7 km N of El Cope, 900 m, *Folsom 1290* (MO). VERAGUAS: Road between Escuela Agricola Alto Piedra and Río Dos Bocas, 730–770 m, *Croat 25937* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto Piedra, *Mori et al. 4001* (MO).

5. AMPHIDAYSA

Amphidaysa Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 180. 1936. TYPE: *Sabicea ambigua* Standley = *Amphidaysa ambigua* (Standl.) Standl.

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[5] *Amaioua pedicellata* Dwyer, spec. nov. *Arbores* 5–10 m altae, ramulis glabris. *Folia* ovato-oblonga, 6–19 cm longa, 2.3–10 cm lata, apicem versus lato-deltoidea attenuato-acuminata acumine ad 1 cm longo, subcoriacea venis lateralibus 12–14; petiolis rigidis, ad 1.5 cm longis. *Inflorescentiae* terminales radiate umbelliformes ad 5 cm longae, pedunculo nullo pedicellis ad 1.5 cm longis. *Flores* cupula calycis cylindrica, ad 5 mm longa, ca. 4 mm lata, truncata dentibus ad 0.3 mm longis. *Fructus* ovato-oblongi vel oblongo-rotundi, ad 1.5 cm longi.

Pittierothamnus Steyermark Bol. Soc. Venez. Cienc. Nat. 23 (101): 92. 1962. TYPE: *Steyermark 86323* (holotype, VEN), *89361* (paratype, VEN), *89763* (paratype, VEN).

Herbs or subshrubs, the stems unbranched. *Leaves* often crowded at the apices of the stems, petiolate, the stipules interpetiolar, large, entire or more often the margin setose pectinate, the processes numerous, unequal. *Inflorescences* axillary or terminal, capitate to trichotomously cymose, the bracts entire to multifid, often obscuring the flowers. *Flowers* with the hypanthium oblong or turbinate, the calycine cup short, the lobes 5, unequal, somewhat foliaceous, persistent; corolla tubular, 5-lobed, the lobes valvate; stamens 5, inserted in the middle of the tube, the anthers linear, dorsifixed; ovary 2-celled, the ovules numerous in each locule, the placentas axile, adnate to the axis. *Fruits* fleshy, indehiscent, the persistent calyx conspicuous.

Amphidaysa is found in Panama, Colombia, Venezuela, and Brazil. The genus includes 6–7 species.

Literature:

Steyermark, J. 1972. *Amphidaysa*, in The Botany of the Guayana Highland Mem. New York Bot. Gard. 23: 316–322.

a. Lobes of the calyx 5–6, 1.2–1.5 mm wide ..... 1. *A. ambigua*
aa. Lobes of the calyx 4, 2–4 mm wide ..... 2. *A. spathulata*

1. **Amphidaysa ambigua** (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 181. 1931.—FIG. 5.

Sabicea ambigua Standley, Field Mus. Nat. Hist., Bot. Ser. 7: 49. 1930. TYPE: Colombia, *Triana 1847*, not seen.

Subshrubs to ¾ m tall, the stem occasionally subprostrate or upright, lignose, often rough with petiole scars, glabrous, the leaves aggregated terminally. *Leaves* oblong, elliptic or occasionally obovate, 7–24 cm long, 2.2–8 cm wide, occasionally subfalcate, deltoid or rounded at the apex, acuminate, the acumen short or to 1 cm long, cuneate at the base, often slightly inequilateral, the costa grooved, plane or prominulous above, prominulous beneath, 1.2–2.5 mm wide proximally, the lateral veins 14–18, plane or prominulous above, prominulous beneath, often opposite, the intervenal areas patulous-reticulate, chartaceous, often discolorous, glabrous above, puberulent beneath, especially on the costa and veins, rarely subsessile; petioles 2–6 cm long, to 0.2 cm wide, puberulent, often flexuous; stipules free, appressed, the sheath rectangular, 4–5 mm long, or much larger (fide Standley), the lobes 6–8 subulate and flabellately disposed, terminal, 2–3 times the length of the body, acute, densely puberulent. *Inflorescences* terminal and axillary, the flowers densely crowded at the apex of the stem, the conglomerate shorter than the petioles of the large leaves. *Flowers* with the hypanthium ca. 4 mm long, pubescent or glabrous, the calycine cup short, the calycine lobes 5–6, lanceolate, 5–12 mm long, 1.2–1.5 mm wide, acute, subcarnose, somewhat villosulose or villose especially on the margins; corolla white, the tube cylindrical, 20–30 mm long, 0.15 cm wide, petaloid to thickly carnose, puberulent on outside, glabrous or with glandular fimbriate structures within, these to 0.8 mm long, the

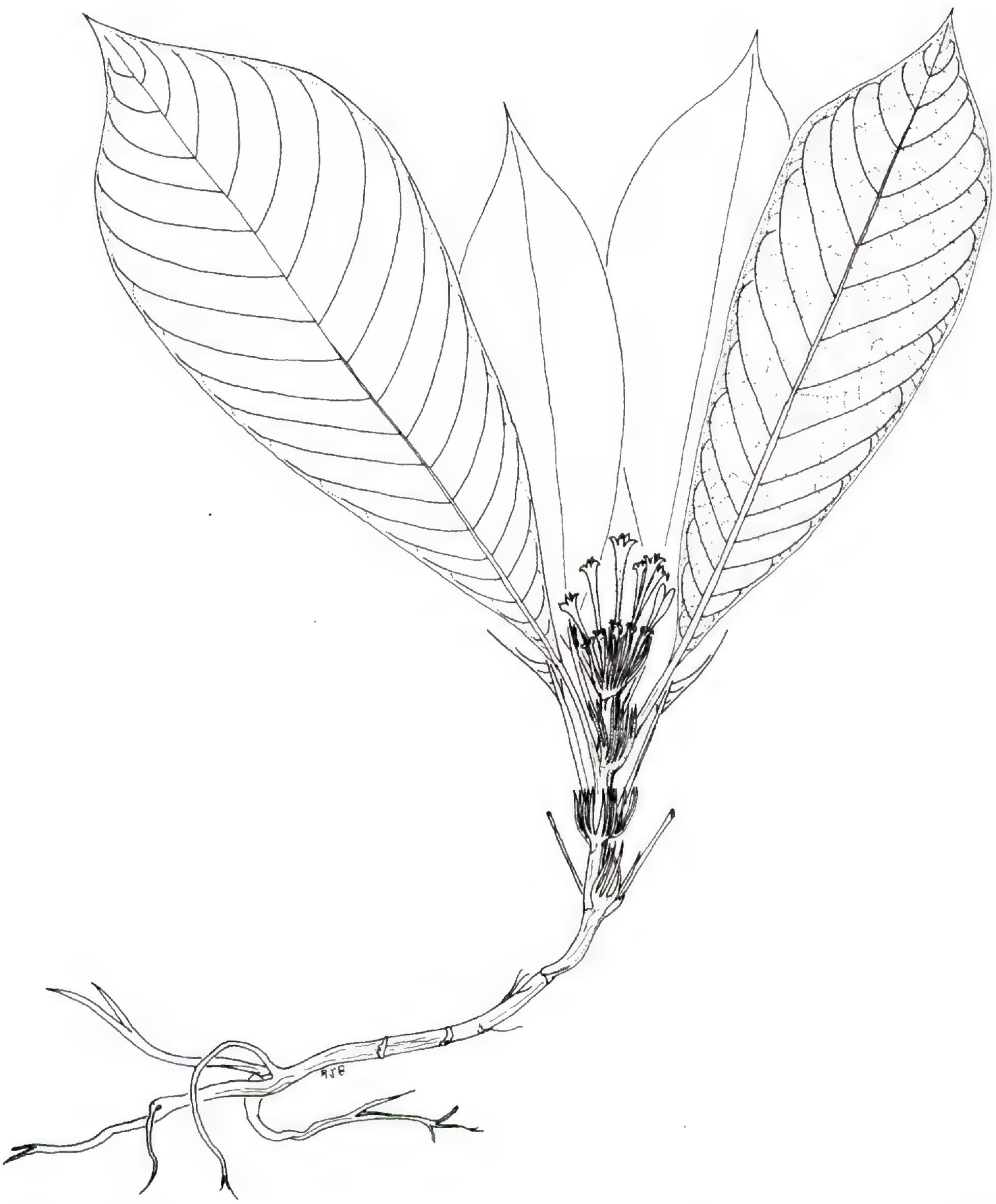

FIGURE 5. *Amphidaysa ambigua* (Standley) Standley. Habit (×½). [After *Dressler & Mahler 2444*.]

lobes 5, narrow lanceolate or narrowly oblong, 3–5 mm long, with glandular fimbriate structures adaxially; stamens 3–5, the anthers oblong or ovate-oblong, 2–2.5 mm long, with a terminal petaloid appendage, subulate, 0.5–1 mm long, acute, the filament short; style slender, to 28 mm long, ca. 0.35 mm wide, the stigmas oblong, 4–5 mm long, 0.7 mm wide. *Fruits* oblong or oblong-rotund, 5–7 mm long; calycine lobes persistent, linear-subulate, unequal, to 17 mm long, acute, ca. 3 times the length of the fruit, the latter truncate, the nectary scar umbonate, the corolla tube scar annular, smooth or rugulose (the pressure of seeds against wall on drying), glabrescent to densely pubescent.

Amphidaysa ambigua is found in Panama and in Colombia. It is of interest that all Panamanian collections were made during the current decade except for *Terry & Terry 1489*.

COLÓN: Santa Rita Ridge, *D'Arcy & D'Arcy 6139* (MO); *Dwyer 8583* (MO). DARIÉN: Cerro Pirre, *Bristan 511* (MO); *Duke 5290, 6114, 13660* (all MO). Caná-Cuasí Trail, Chepigana, *Terry & Terry 1489* (MO). PANAMÁ: Road to Cartí, 13 km N El Llano, *Busey 385* (MO). Campo Tres, 5 km NE Altos de Pacora, *Busey 828* (MO). Road from El Llano to Cartí-Tupile, *Kennedy et al. 2444* (MO). La Eneida, Cerro Jefe, *Maas & Dressler 682* (MO). Road from El Llano to Cartí-Tupile, *Dressler & Mahler 2444* (MO); *Liesner 652* (MO), *1142* (MO); *Mori, Gentry & Kallunki 4558* (MO); *Mori & Kallunki 5135* (MO); *Mori 7710* (MO). 7 km W of Santa Fé, ca. 2900 ft, *Nee 11261* (MO). SAN BLAS: Trail from El Llano to Cartí-Tupile, *Kennedy 2579* (MO). COLOMBIA: CHOCO: N of Alto Curiche, *Duke & Idrobo 11228* (MO). Bahia Solano (Puerto Mutis), *Gentry & Forero 7228* (MO).

2. **Amphidaysa spathulata** Dwyer, spec. nov.[6] TYPE: Panamá, *Duke 15615* (MO).

Subshrubs about ⅓ m tall, the stem erect, simple, terete, glabrous to glabrescent, the leaves crowded toward the apex. *Leaves* sessile or subsessile, oblong, 4.5–16 cm long, 1.8–8 cm wide, deltoid or obtuse at the apex, cuneate or attenuate-acute at the base, the costa slender, prominulous above or subsulcate, subprominent beneath, the lateral veins ca. 14, arcuate, forming an undulate vein beneath the margin, the pair of lateral veins including 1–2 subparallel veins, stiffly membranaceous, glabrous above, the raphides numerous, white, puberulent on the costa and veins; stipules free, puberulent, the body 2 mm long, thin, provided with glandular fimbriate structures within, with 6–8 linear setas, 0.4–0.6 mm long. *Inflorescences* to 4 cm long, the cymes sometimes on reduced branches. *Flowers* with the hypanthium narrow oblong, to 4 mm long, glabrous, the lobes of the calyx, elliptic-spathulate or narrowly obovate oblong, to 11 mm long, 2–4 mm wide, the blade 5.5–6.5 mm long, foliose, often 5-veined, acute, puberulent, the claw rigid puberulent, often longer than the blade, scarcely alate; corolla white, with the tube narrowly cylindrical, to 3 cm long, 2 mm wide, glabrous, the lobes 5, lanceolate, to 6 mm long, acute; stamens 4, the anthers oblong rotund, the acumen ca. 0.4 mm long; stigmas 2, subulate, ca. 2.5 mm long. *Fruits* subsessile or on thick pedicels, puberulent, these provided with a stipuloid bracteole toward the apex, this with 5 setas, linear subulate, to 8 mm long, narrowly oblong, to 1.5 cm long, 0.4 cm wide, 6-angled, lignose, drying black, with 8 slender ribs.

The new species is known only from Panama but it is to be expected in Colombia. It is closely related to *A. neblinae* Steyermark from Brazil which has more acute leaves and narrower calycine lobes.

DARIÉN: Cerro Campamento, S of Cerro Pirre, *Duke 15615* (MO), *15731* (US).

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[6] *Suffrutices* foliis confertis. *Folia* sessilia vel subsessilia oblonga, 4.5–16 cm longa, 1.8–8 cm lata, venis lateralibus 14, rigido-membranacea supra glabra; petiolis ad 0.5 cm longis; stipulis liberis, corpore 2 mm longo, tenui intus fimbriis glandulis instructo setas 8 lineares ferente, eas 0.4–0.6 mm longas. *Inflorescentiae* ad 4 cm longae. *Flores* lobis calycis 4 elliptico-spathulatis vel angusto-obovato-oblongis, ad 11 mm longis, 2–4 mm latis, lamina 5.5–6.5 mm longa, foliosa; corolla tubo ad 3 cm longo, 0.2 cm lato, glabro, lobis 5, ad 6 mm longis; staminibus 4, antheris acumine ad 0.4 mm longo. *Fructus* subsessiles vel in pedicellis crassis versus apicem bracteola stipulanea praediti, hac 5 setis lineari-subulatis ornata, angusto-oblongi, ad 1.5 cm longi, 6-angulati costis 8 instructi.

6. ANTIRHEA

Antirhea Commerson A. L. Juss., Gen. Pl. 204. 1789 ('Antirhea'). TYPE: *A. borbonica* J. F. Gmelin.

Antirhoea Endlicher, Ench. 272, 692. 15–21 Aug. 1841 orth. mut.
Stenostomum Gaertn. Fruct. Sem. Pl. 3: 69. 1806. TYPE: *S. lucidum* (Swartz) C. F. Gaertn.
Sturmia Gaertn. Fruct. Sem. Pl. *pl. 192.* 1805, not *Sturmia* Hoppe (1799), not *Sturmia* Reichb. (1828). TYPE: *S. lucida* Gaertn.

Trees or shrubs. *Leaves* often coriaceous, the stipules deciduous or persistent. *Inflorescences* axillary, cymose, the peduncle when present with branches spreading, the flowers secundly disposed, the bracteoles present or absent. *Flowers* with the hypanthium ovoid or obovoid, the calyx lobes persistent; corolla funnelform, the 4–5 lobes imbricate, 2 of them exterior; stamens 4–5, included or scarcely exserted, the anthers slender, dorsifixed, often pubescent; style slender, the stigma knoblike or 2–3-lobed, included, the ovary 2–10-celled, the ovules solitary, pendulous. *Fruits* drupaceous, thin carnose, the shell ligneous or bony, the seeds elongate, pendulous.

Antirhea, with about 40 species, occurs in the West Indies, Panama, Madagascar, in tropical East Asia to Australia.

1. **Antirhea trichantha** (Griseb.) Hemsley, Biol. Centr. Amer., Bot. 2: 42. 1881.—FIG. 6.

Pittoniotis trichantha Griseb., Bonplandia 6: 8. 1858. TYPE: *Duchaissing* (? P, not seen).

Trees to 10 m tall, the twiglets round, smooth, drying black, glabrous or puberulent. *Leaves* oblong to ovate-rotund, 6–21 cm long, 2.5–8.5 cm wide, subequilateral, deltoid to rounded at the apex, often contracted into a narrow cusp to 2 cm long, usually acute, occasionally obtuse, basally acute to cuneate, the costa subplane above, prominulous to subprominent beneath, the lateral veins ca. 12, arcuate, the intervenal areas irregular pinnatiform, chartaceous, discolorous, densely strigillose above, densely pilose or villose beneath; petioles slender or stout, to 3 cm long, 0.8–1.5 mm wide, pilose; stipules persistent or decidous, appressed to the stem, triangular subulate, to 1.5 cm long, pilose. *Inflorescences* several at apices of the twiglets, axillary, spreading; peduncles usually wiry, 4–7 cm long, ca. 0.8–1.5 mm wide, strict or flexuous, with a few alternate flexuous branches, these spreading, either with few flowers or occasionally with flowers densely congested, the flowers secundly disposed. *Flowers* with hypanthium oblong rotund or oblong, ca. 1.5 mm long, densely pubescent, the calycine cup short, the teeth 5, oblong rotund, to 0.4 mm long, obtuse, petaloid, pubescent on the margin and outside; corolla white with the tube narrowly cylindrical or narrowly funnelform, 2.5–3 mm long, ca. 0.6 mm wide, petaloid, glabrous within, the lobes 5, oblong, about as long as the tube, densely villose above; stamens 5, exserted, the anthers linear oblong, 1.6–2 mm long, villose, the filaments linear, elongate, 0.5–2 mm long, attached at the corolla mouth; stigmas linear oblong, ½ the length of the style, the style slender but dilated below stigmas. *Fruits* drupaceous, drying red, fleshy, oblong, 0.5–0.8 mm long, usually twice as long

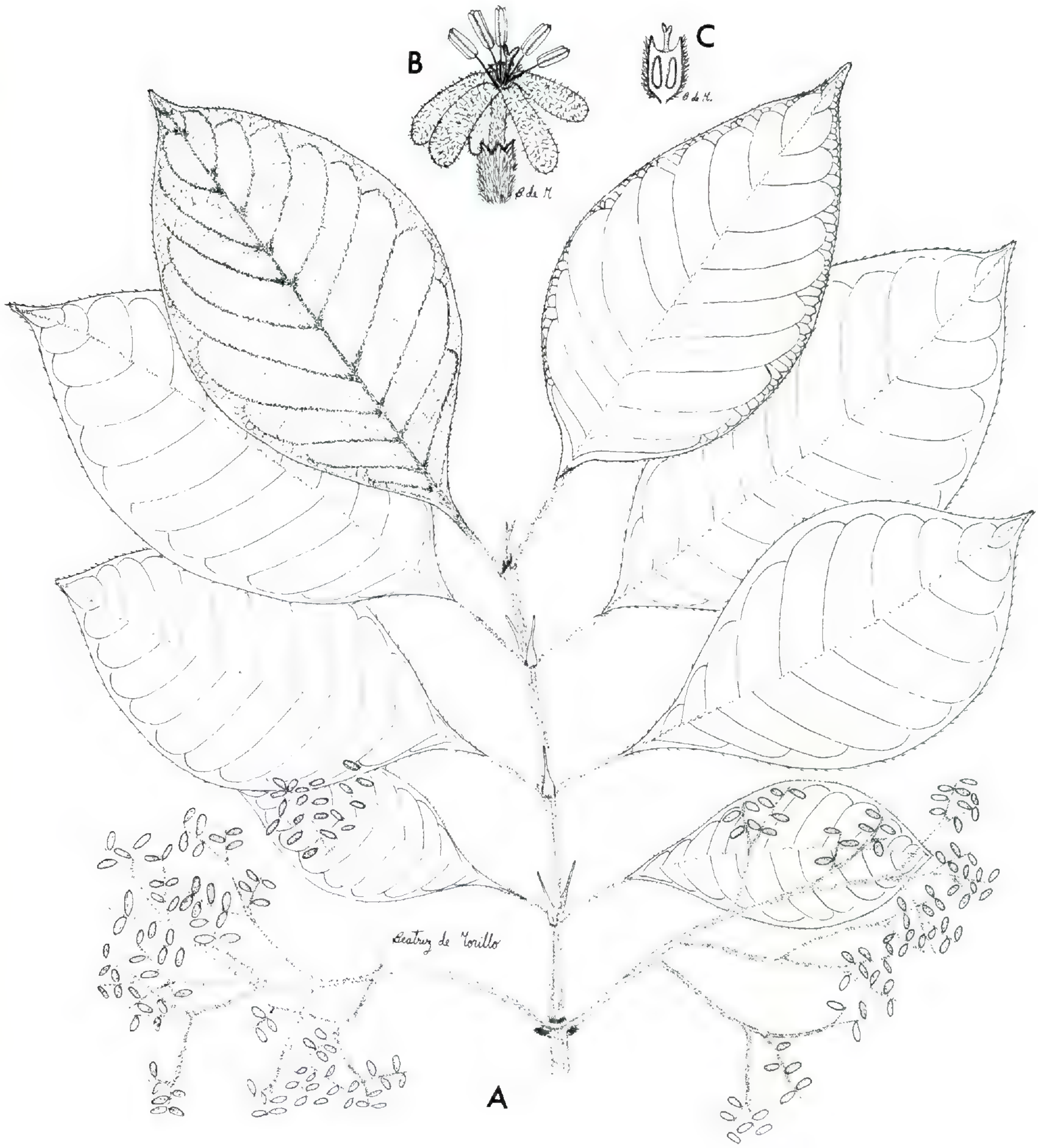

FIGURE 6. *Antirhea trichantha* (Griseb.) Hemsley.—A. Habit (×.45).—B. Flower (×4.5).—C. Ovary, cross section (×4.5). [After *Stern et al. 149.*]

as wide, capped by a calycine cup to 0.8 mm long, drying black or brown, glabrate, delicately longitudinally veined, seed solitary ca. 5 mm long, unilaterally grooved.

Antirhea trichantha is known only from Panama. Few collections have been made outside the Canal Zone.

CANAL ZONE: Victoria Fill, *Allen 1761* (MO). Chiva-Chiva Road, 1 mi E of Gaillard Highway, *Blum 468* (MO). Albrook Tower, vicinity TTC site, *Blum 551* (MO). C-15 Road to TTC Albrook Tower, *Blum 2240* (MO). Vicinity of Río Cocolí, Road K-9, *Chambers et al. 37* (MO). Madden Forest Preserve, *Correa 146* (MO). Gaillard Highway near Penitentiary, *Croat 9311* (MO). Road C 2 F, ½ mi NW Summit Naval Radio Station, *Croat 11033* (MO). Fort Kobbe, *Duke & Mussell 6667* (MO).

Power Station near Fort Kobbe, *Dwyer 2668* (MO). US Army TTC, Albrook, *Dwyer 6727* (MO). Madden Dam, *Dwyer & Elias 7477* (GH, MO, US). Madden Dam, Boy Scout Road, *Dwyer & Lallathin 8579, 8824* (both MO). Madden Dam, *Dwyer & Robyns 24* (MO). Farfan Beach Road, *Gentry 4901* (MO). Navy Pipeline Preserve, 3 mi NW Gamboa, *Haines 509* (MO). Madden Dam, *Holdridge 6248* (MO). Madden Dam, Boy Scout Road, *Kirkbride 45* (MO). Farfan Beach, *Kirkbride & Elias 74* (MO). US Navy Ammunition Depot, 2 mi NW of Balboa, *Luteyn & Foster 930* (MO). Howard Air Force Base, SE Kobbe Beach, *Oliver & MacBryde 1874* (MO). Madden Dam, Boy Scout Road, *Porter et al. 4015* (COL, DUKE, MO, SCZ, UC, VEN). Naval Ammunition Depot, *Stern et al. 38* (MO). Farfan Beach, *Tyson 1824* (MO). BARRO COLORADO ISLAND: *Croat 4971, 6336, 10391, 11973, 14255* (all MO). DARIÉN: Río Pucro below village of Pucro, *Duke 13134* (MO). El Punteadero bridge, over Río Chucunaque, *Stern et al. 149* (MO). PANAMÁ: Mocambo, *Croat 14906* (MO). Río Pita, *Duke 4800* (MO). Chilibre, *Lao & Holdridge 8* (MO). 6 km SW Arraijan, old road to Bique, *Nee 6890* (MO).

7. APPUNIA

Appunia Hook. f. in Benth. & Hook. f., Gen. Pl. 2: 120. 1873. TYPE: *A. tenuiflora* B. & H.

Bellynkxia Muell.-Arg., Flora 48: 465. 1875. TYPE: *B. angulata* Muell.-Arg.

Shrubs or small trees. *Leaves* usually lanceolate, opposite; stipules free, subulate acuminate. *Inflorescences* terminal or axillary, the flowers few, congested into a small head at the end of the peduncle. *Flowers* with the hypanthium somewhat coherent, the calycine cup truncate, the teeth absent or scarcely visible, funnelform or U-shaped, the lobes usually 5, valvate; ovary 4-celled, with an ascending, solitary ovule in each cell. *Fruits* sessile, aggregate, but virtually free at maturity, each fruitlet fleshy, drupaceous, with 4 pyrenes, each pyrene unequally 2-locellate, the ventral part empty; seeds exalbuminous.

Appunia is a genus of approximately 10 species in Central and South America.

Literature:

Hayden, M. V. & J. D. Dwyer. 1969. Seed Morphology in the Tribe Morindeae. Bull. Torrey Bot. Club 96: 704–710.

1. **Appunia seibertii** Standley, Ann. Missouri Bot. Gard. 24: 208. 1937. TYPE: Panamá, *Seibert 624*.—FIG. 7.

Shrubs to 1.5 m tall, the branches exfoliate, subterete, smooth, red brown and cracking when dry, glabrous or puberulent, the nodes thickened, the branchlets slender. *Leaves* somewhat verticillate at the apex of the branchlets, narrow elliptic, rarely subrhombiform or obpyriform, acute or deltoid at the apex, attenuate cuneate at the base, 5–17 cm long, 1–7 cm wide, membranaceous, scarcely discolorous, often green when dry, glabrous or scattered granulose above, the intervenal areas minutely granulose beneath, the costa slender, prominulous above, subplane distally beneath, the lateral veins opposite or alternate, ca. 12, slender, prominulous, widely arcuate, the veins white puberulent, the margins glabrous or minutely puberulent; petioles 0.3–2 cm long, ca. 0.7 cm wide, puberulent; stipules triangular, 2.5–5(–7) mm long, 2–4 mm wide, smooth, glabrous, entire. *Inflorescences* 1–4, pseudoterminal, arising from the axils of the fasciculate leaves, the peduncles several per axil, umbellately disposed, slender, 0.5–1.5 cm

FIGURE 7. *Appunia seibertii* Standley.—A. Habit (×4.5). [After *Oliver & MacBryde 1896.*]—B. Fruit (×.09). [After *Duke 4713.*]

long, ca. 0.5 mm in diam., minutely red or white puberulent, the flowers aggregated into a solitary terminal head ca. 4 mm in diam., with 10–11 flowers. *Flowers* sessile; calyx cupuliform, ca. 1.5 mm in diam., the teeth absent or sometimes as irregular points, to 0.5 mm long, fleshy, glabrous, the raphides many; corolla (in bud) with the tube ca. 7 mm long, ca. 2 mm wide, glabrous outside, pubescent within, the lobes 5, oblong to triangular, scarcely shorter than the tube, briefly cucullate; anthers 5, oblong, to 2 mm long, the filaments attached near the apex of the tube; ovary 4-loculate, the septa thick, the style short, the stigmas 2,

subulate ca. 1.25 mm long. *Fruits* sessile, usually 2–5, crowded at the apex of the peduncle, the individual fruits turbinate, to 1 cm long, black and smooth when dry, often inconspicuously 4-lobate, each pyrene unequally 2-locellate, the ventral part empty, bulliform, the endocarp replete with raphides; seeds 4, oblong, ca. 5 mm long, slightly winged.

This species is known from Panama and Colombia. Additional notes may be found in Dwyer & Hayden (1969), where there is an emended description of the species.

In forming fruit often several flowers of the mass fail to mature.

The persistent calycine tube and floral disc, as well as the hypanthium, simulate a *Morinda* fruit in miniature.

CANAL ZONE: Fort Kobbe, *Duke 3958, 4246, 4698, 4713* (all MO). Howard Air Force Base, SE of Kobbe Beach, *Oliver & MacBryde 1896* (GH, MO, US). DARIÉN: Without locality, *Bristan 207* (MO). El Real to Pinogana, *Duke 5126* (MO). Río Pucro to Quebrada Maskia, *Duke 13082* (MO). Río Mortí, Camp Mortí Hydro, *Duke 14118* (MO). Chepigana, *Duke & Bristan 267* (MO). Río Tuquesa, lower Tuquesa Mining Camp called Charco Chiva, *Mori 6987* (MO). Periaque camp at river, *Tyson et al. 4767* (MO). PANAMÁ: Río Bayano above confluence with Río Chepo, *Duke 4000* (MO). Cermeño, *Dwyer 5604* (MO). Arenoso, lower Río Trinidad, *Seibert 624* (MO). 2 mi E of El Llano, *Tyson 1749* (MO). SAN BLAS: Isla Piño near Mulatupo, *Elias 1718* (MO, UC, VEN).

8. ARCYTOPHYLLUM

Arcytophyllum Willd. ex. Schultes in R. & S., Syst. Veg. 3: 5. 1827. TYPE: *A. blaerioides* Willd. ex. J. S. & J. H. Schultes.

Mallostoma Karst., Fl. Colomb. 2: 9. 1862. TYPE not indicated.
Rachicallis DC., Prodr. 4: 433. 1833. TYPE: *R. rupestris* (Sw.) A. P. DeCandolle, based on *Hedyotis rupestris* Sw.
Pseudorhachicallis Benth. & Hook., Gen. Pl. 2: 60. 1873. TYPE not indicated.
Ereicoctis Kuntze, Rev. Gen. Pl. 281. 1891. TYPE not indicated.

Shrubs or subshrubs, erect or prostrate. *Leaves* small, crowded, often densely imbricate, coriaceous; stipules entire, bifid or setose. *Inflorescences* cymose or flowers solitary, axillary. *Flowers* with the hypanthium globose or turbinate, the calyx 4–5 lobed, often with glands between the lobes; corolla funnelshaped or salverform, the lobes 4; stamens with the anthers included or exserted, dorsifixed, the filaments short and adnate to the tube in riblike fashion; style slender, the stigmas 2, short, the ovary 2-celled, the placentas adnate to the septum. *Fruits* capsular, turbinate to globose, 2-celled, usually septicidally dehiscent to the base; seeds few, boatshaped or plano convex, oblong, punctate, winged.

Arcytophyllum, a genus of about 30 species, ranges from Mexico through Central America, extending to the Andes of South America.

1. **Arcytophyllum lavarum** Schum. in Engl. & Prantl, Nat. Pflanzenfam. IV (4): 28. 1891. TYPE: Panamá, *Maxon 5349* (US, holotype).—FIG. 8.

Mallostoma lavarum (Schum.) Donnell. Smith, Enum. Pl. Guatem. 5: 36. 1899.

Subshrubs, ericoid in habit, profusely branched, the branches lax, glabrous, drying silver tan or purple black, ridged, the nodes well spaced or crowded, swollen (bases of persistent stipules). *Leaves* oblong, 0.5–0.8 cm long, 0.2–0.4

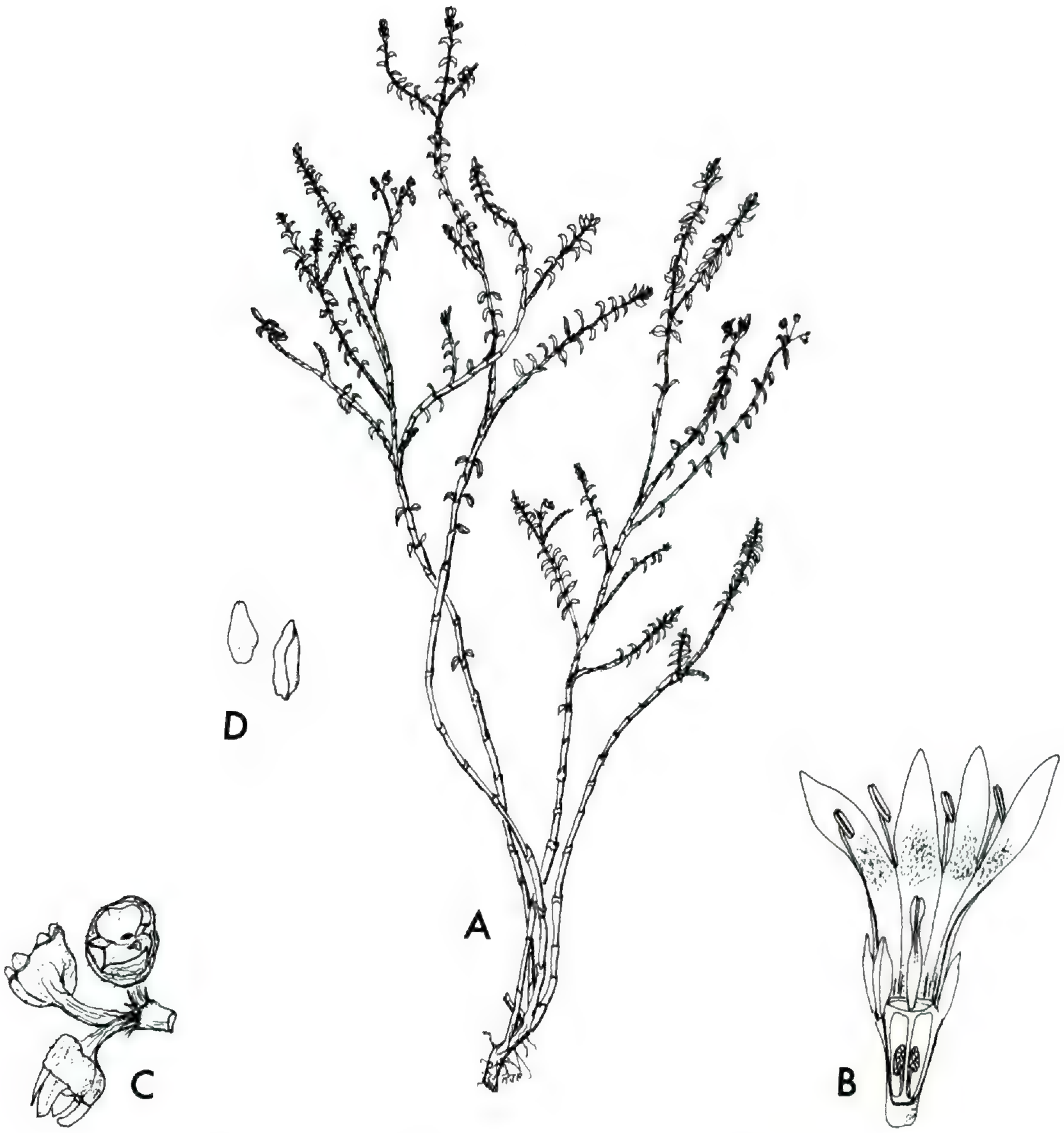

FIGURE 8. *Arcytophyllum lavarum* Schum.—A. Habit (×½).—B. Flower, opened (×5).—C. Fruits (×5).—D. Seeds (×5). [After *Wilbur et al. 11033.*]

cm wide, obtuse at the apex, obtuse to truncate at the base, the costa and the lateral veins evanescent, carnose, ericoid, lustrous, scarcely bicolorous, marcescent on drying; petioles to 1 mm long or absent; stipules connate, disposed as a short cup, to 0.25 cm long, the free portion deltoid, longer than the cup and often contiguous with the stipule above, the margin erose with a few ascending irregular subulate teeth. *Inflorescences* terminal, to 1.5 cm beyond the uppermost leaves, usually with 2 peduncles, to 0.3 cm long, each bearing a terminal cymule. *Flowers* with the hypanthium rotund, to 0.65 mm long, petaloid, glabrous, the calycine cup very short, with patches of flabellately disposed minute oblong glands and squamellae intermixed within, the teeth 4, erect, oblong or ovate oblong, often obtuse, to 1.3 mm long, often with an upright gland at the junction of 2 lobes, glabrous, petaloid; corolla white, white tinged with purple, blue or lavender pink, the tube campanulate oblong, ca. 2.5 mm long, the lobes not cucullate, villosulose on the adaxial face; stamens 4, the anthers oblong, 0.8–1 mm long, dorsifixed,

the filaments slender, attached above the middle of the tube, the style slender, ca. 4 mm long, slightly dilated apically, the stigmas 2, clavate when connate, ca. 0.4 mm long; ovary thin walled, the septum thin, the ovules several, arising on a distinct stipe attached almost at the base of the septum, the locule ample. *Fruits* short pedicellate, capsular, rotund or compressed rotund, to 1.5 mm in diam., truncate, the calycine lobes persistent, a thin annular ring marking their point of origin, the valves splitting from the apex.

Arcytophyllum lavarum is restricted to high mountainous regions of Costa Rica and Chiriqui. A photo of *A. lavarum* at MO is labeled as a Pittier collection (unnumbered) from Costa Rica, deposited in Berlin, but this is not the type.

CHIRIQUÍ: Volcán de Chiriquí, *Davidson 1293* (F, MO). Between Barú and Respinga, 3000 m, *D'Arcy 10095* (MO). Chiriquí Volcano, 3374 m, *Maxon 5349* (US). W side of Volcán Barú, ca. 3000 m, *Mori & Bolten 7342* (MO). Trail to summit, Volcán de Chiriquí 2500–3400 m, *Mori & Kallunki 5748* (MO). Volcán de Chiriquí, W slope, *Wilbur et al. 11033* (F, MO). Potrero Muleto to summit of Volcán de Chiriquí, *Woodson & Schery 437* (MO). Loma Larga to summit of Volcán de Chiriquí, *Woodson et al. 1087* (F, MO).

9. BATHYSA

Bathysa Presl., Bot. Bemerk. 84. 1844. TYPE: *B. stipulata* Presl.

Trees or shrubs. *Leaves* opposite, the stipules interpetiolar, entire, occasionally persistent. *Inflorescences* terminal, paniculate. *Flowers* abundant, the calycine cup truncate, the teeth 4–5; corolla subrotate to infundibuliform, the lobes 4–5, imbricate; stamens 4–5, inserted on the mouth, the anthers dorsifixed, exserted; ovary 2-celled, the ovules numerous. *Fruits* capsular, septicidally dehiscent, splitting into 2 valves from the apex; seeds minute, horizontal, compressed or angular, winged or not, the testa reticulate.

Bathysa ranges from Panama through Venezuela, Brazil, and Peru. It is a genus of about 10 species.

1. **Bathysa veraguensis** Dwyer.[7] TYPE: Panamá, *Lao & Gentry 531* (MO, holotype).—FIG. 9.

Trees to 5 m tall, the branchlets terete, minutely velutinous, the nodes well spaced. *Leaves* large, widely oblong, 10.5–31.0 cm long, 4.5–18.0 cm wide, widely deltoid toward the apex, occasionally rounded, acuminate, the acumen short, widely deltoid or narrowly deltoid, to 1.8 cm long, 0.3–0.5 cm wide in the middle, basally widely cuneate, obtuse or truncate, the costa prominulous above, prominent beneath, the lateral veins 15–19, to 2 cm apart in the middle of the

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[7] *Bathysa veraguensis* Dwyer, spec. nov. *Arbores* ad 5 m altae. *Folia* magna, 10.5–31.0 cm longa, 4.5–18.0 cm lata, venis lateralibus 15–19 papyracea supra in costa venisque aureo-villosula cetera minute scabridula subtus dense aureovelutina. *Inflorescentiae* terminales amplae, ad 30 cm longae, cymulis plerumque 3-floribus; bracteis ovato-lanceolatis, ad 1.3 cm longis. *Flores* cupula calycis ampla ca. 2.5 mm alta, apice ca. 0.6 cm lata, lobis 4–5, ad 5 mm longis; corolla alba tubo 3.3–5.0 mm longo, lobis ca. 6 mm longis; antheris ca. 3.2 mm longis, filamentis crasso-subulatis. *Fructus* oblongi vel turbinati, ad 1.5 cm longi, ca. 0.5 cm lati, extus puberuli calyce persistenti magno ad 1 cm longo, fortasse 2-plo longitudine pericarpium superanti seminibus polymorphis plano-compressis reticulatis ad 0.8 mm longis.

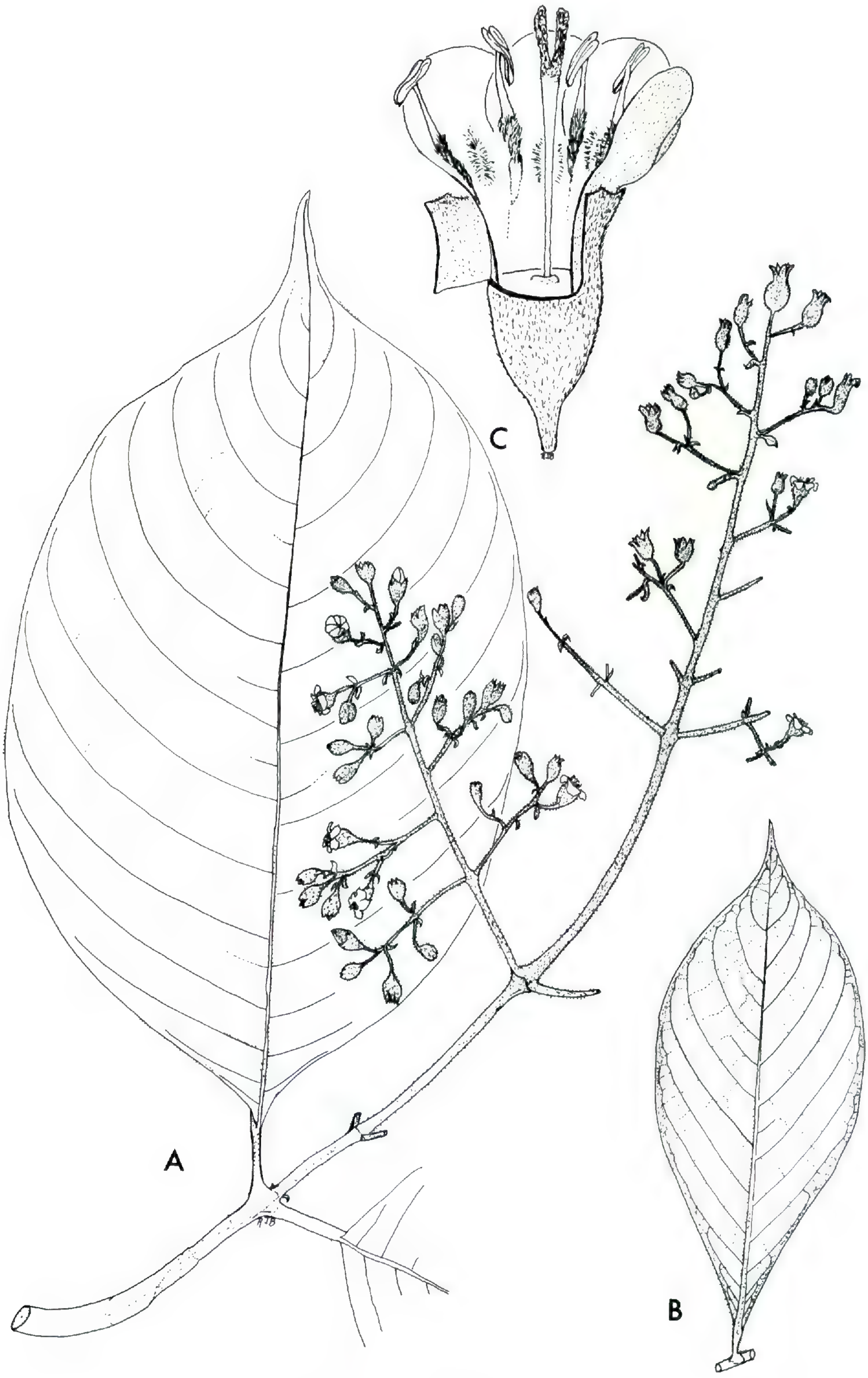

FIGURE 9. *Bathysa veraguensis* Dwyer.—A. Inflorescence and leaf (×.45).—B. Leaf underside (×.45).—C. Flower, opened (×3.15). [After *Lao & Gentry 531*.]

blade, the venules irregular perpendicular, papyraceous, discolorous, dark red to brown when dry, golden villosulose above on the costa and the veins, otherwise scabridulous, beneath densely golden velutinous; petioles and stipules not seen. *Inflorescences* terminal, solitary, pyramidal paniculate, to 30 cm long, to 30 cm wide, velutinous; peduncle to 8 cm long, to 0.35 cm wide, thick, lignose, the branches often opposite, to 15 cm long, the pairs well spaced, often 6–7 cm apart, the cymules often 3-flowered, disposed on long or short secondary branches or on tertiary branches, each branch provided with 3 flowers, rarely with one flower; bracts ovate lanceolate, to 1.3 cm long, acute, appressed villose outside, inside with a few hairs; bracteoles ovate subulate. *Flowers* pedicellate, the pedicels 0.3–1.0 cm long, hypanthium turbinate, 0.3 cm long, puberulent, the calycine cup expanded, 2.5 mm long, 0.6 mm wide at the apex, eglandular within, the lobes 4–5, oblong triangular, 5 mm long, often ascending, 0.4–0.5 cm wide at the base, obtuse, coriaceous, puberulent or appressed villose within; corolla white, the tube compressed cylindrical, 3.3–5.0 mm long, often to 0.5 cm wide, glabrous outside, within densely golden villose near the mouth, the lobes imbricate in bud, oblong rotund, 6 mm long; stamens 5, the anthers narrowly oblong, 3.2 mm long, slightly curved at anthesis, obtuse, exserted, the filaments attached near the mouth, thickly subulate, 3 mm long; ovarian disc ringlike, 3.0–4.5 mm long, 1.3–1.6 mm wide, 0.5–0.65 mm deep, the style thick, 7.5 mm long, the stigmas 2, thick, narrowly oblong, 2.5 mm long. *Fruits* immature? oblong or turbinate, to 1.5 cm long (including calyx), ca. 0.5 cm wide, the persistent calyx as in flowering stage, perhaps 2 times the length of the pericarp, densely puberulent outside, densely appressed villose within; seeds polymorphic, mostly oblong, to 0.8 mm long, compressed, reticulate.

Bathysa veraguensis is known only from Panama. The genus is not otherwise known in Central America.

COCLÉ: Cerro Pilón, ca. 3100 ft, *Dwyer & Lallathin 8641* (MO). Cerro Pilón, hill below summit, ca. 2500 ft, *Dwyer et al. 4544* (MO). VERAGUAS: Cerro Tute, 1200 m, *Lao & Gentry 531* (MO). NW of Santa Fé, 2.1 km from Escuela Agrícola Alto de Piedra, *Mori & Kallunki 4768* (MO).

10. BERTIERA

Bertiera Aubl., Hist. Pl. Guiane 180. 1775. "*Berthiera*" TYPE: *B. guianensis* Aublet.

Shrubs or small trees. *Leaves* petiolate or sessile; stipules connate, the sheath bifid. *Inflorescences* terminal, cymose paniculate, pedunculate, the bracts narrow. *Flowers* with the hypanthium subglobose or turbinate, the calycine cup truncate and edentate or with 5 teeth; corolla funnelshaped, the tube usually sericeous outside, the lobes 5, ovate, contorted; stamens 5, the anthers ovate or subulate, dorsifixed, the connective acuminate or produced at the apex, the filaments short, attached to the tube; ovarian disc cupular or annular, the style slender, glabrous, the stigmas entire or disposed as 2 narrow lobes, the ovary 2-celled, the ovules numerous, the placentas entire, affixed to the septum. *Fruits* baccate, fleshy; seeds numerous, small, angulate, the testa foveolate or granulate.

Bertiera occurs in tropical America and in Africa. It is a genus of about 30 species.

Literature:

Standley, P. S. 1934. 65. *Bertiera* Aubl., N. Am. Fl. 32(3): 180–181.

a. Leaves with 8–9 lateral veins; stipules 1.5(–2.0) cm long ..... 1. *B. angustifolia*
aa. Leaves with ca. 7 lateral veins; stipules 0.9–1.2 cm long ..... 2. *B. guianensis*

1. **Bertiera angustifolia** Benth., Bot. Voy. Sulphur 103. 1844. TYPE: Cocos Island, Costa Rica, not seen.

Shrubs or trees to 5 m tall, the branchlets terete, smooth, densely pilose, the nodes well spaced. *Leaves* arising as juveniles from a cylindrical bract or pair of bracts, to 2 cm long, the bract drying brown, puberulent; leaf blades ovate oblong, 9–17 cm long, 2.7–7.5 cm wide, acute toward the apex, acuminate, the acumen often inconspicuous, obtuse or rounded at the base, the costa prominulous, the lateral veins 8–9, strongly ascending, sometimes immersed above, papery when dry, rubescent above, glabrous except for the costa, glabrous beneath except for the costa and veins, the hairs appressed, elongate; petioles to 0.5 cm long, pubescent; stipules triangular subulate, to 1.5(–2.0) cm long, ca. 0.5 cm wide at the base, ultimately appressed to the stem. *Inflorescences* terminal, solitary, paniculate, puberulent, to 17 cm long, to 7(–10) cm wide; peduncle slender, 3.5–7.0 cm long, to 0.18 cm wide, the rachis somewhat flexuous, the branches alternate or opposite, rarely 4-verticillate; bracts and bracteoles linear subulate, equal to the nonfloriferous parts of the branchlets. *Flowers* small (in bud); hypanthium oblong, to 1.5 mm long, pubescent, the calycine cup small, the teeth 5, small, triangular; corolla tube 1.5–2.0 mm long, carnose, glabrous or sparsely puberulent outside, densely villose inside, the lobes deltoid, to 1.3 mm long, acute; stamens 5, the anthers oblong, to 1.5 mm long, short acuminate at the apex, the acumen ca. 0.3 mm long. *Fruits* sessile, rotund, 3 mm in diam., drying black, glabrate to sparsely pubescent, the hairs short, strigose, the ribs obvious, obtusely marginate, the calycine cup vestigial.

Bertiera angustifolia is known only from Costa Rica (Cocos Island), Panama and Peru. Standley erroneously annotated *Mexia 6358* from Pongo de Manseriche, Dept. Loreto, Peru as *Bertiera parviflora* Spruce. This collection matches well the three Panama collections cited below. The photo (MO) of the type of *Bertiera parviflora* (*Spruce 2774*) does not match the three Panama collections; the lateral veins are only 5–6 in the type but 8 or 9 in *B. angustifolia*.

Bentham described the leaves of *B. angustifolia* as "pellucid-punctate," but this is not so in the Panamanian collections. The only genus of Rubiaceae in Panama with pellucid-punctate leaves is *Rustia*.

BOCAS DEL TORO: Between Quebrada Menaco and Buena Vista, Chiriquí Trail, *Kirkbride & Duke 666* (MO). DARIÉN: Caná, 1750 ft, *Stern et al. 403* (MO). VERAGUAS: Río Primero Brazo, 2.5 km beyond Agricultural School, Alto Piedra, 700–750 m, *Croat 25477* (MO).

2. **Bertiera guianensis** Aubl., Hist. Pl. Guiane 1: 180. 1775. TYPE: French Guiana, *Aublet* (P, holotype, not seen).—FIG. 10.

B. palustris A. Rich., D.C., Prodr. 4: 392. 1830.
B. aequaliramosa Steyermark, Mem. New York Bot. Gard. 17(1): 319. 1967. SYNTYPE: Panamá, *Cooper 586* (NY, holotype).

B. guianensis var. *leiophylla* Steyermark, Mem. N.Y. Bot. Garden 17: 319. 1967. TYPE: Panamá, *Pittier 5178* (NY, holotype).
B. tenuis Lundell, Wrightia 4: 49. 1968. TYPE: Guatemala, *Contreras 4318* (LL, holotype).

Shrubs or small trees to 4 m tall, the branchlets terete, slender, appressed villose, the nodes well spaced. *Leaves* oblong, 8–17 cm long, 2–6 cm wide, acute and often vaguely acuminate at the apex, acute or cuneate at the base, the costa prominulous above and beneath, ca. 0.1 cm wide proximally, the lateral veins ca. 7, arcuate, occasionally strict and sharply ascending, discolorous or not, glabrous above and beneath except villose along the costa and veins; petioles slender, to 0.2 cm wide, 0.2–2.0 cm long; stipules deltoid, narrowly or roundly so, 0.9–1.2 cm long, ca. 0.3 cm wide, pubescent. *Inflorescences* terminal, solitary, cymose thyrsoid, to 16 cm long, to 6.5 cm wide, the peduncle to 7 cm long, stiff but thin, 1.0–1.5 mm wide, densely villose, the branches well spaced, the lowermost opposite or whorled, subperpendicular; bracts persistent, subulate, to 6 mm long, the flowers secund. *Flowers* with the hypanthium subrotund, ca. 1 mm long, pubescent, the calycine cup short, the teeth 5–6, vague or as distinct short points; corolla white, the tube cylindrical, to 6 mm long, 0.8 cm wide in the middle, glabrate outside and within, the lobes 5, oblong, acute, villose within; stamens 5–6, the anthers 0.8–1.5 mm long, acuminate at the apex, the acumen to 0.35 mm long, acute, sagittate at the base, attached near the mouth; stigmas 2, oblong lanceolate, ca. 2 mm long, the style slender, ca. 2.5 mm long, the ovary thick walled, replete with resinous dots. *Fruits* sessile, rotund, 3.5–4.0 mm in diam., the pyrenes 6-costate, drying black; seeds obtusely 3-angled, ca. 1.5 mm in diam., muricate.

Bertiera guianensis ranges from Mexico to Panama, the Guianas, and south to Bolivia. It also occurs in the West Indies.

BOCAS DEL TORO: Buena Vista, Almirante, *Cooper 586* (NY, US). BARRO COLORADO ISLAND: *Aviles 9* (MO); *Croat 12503* (MO); *Foster 774* (MO). CHIRIQUÍ: San Félix, *Pittier 5178* (US). DARIÉN: Airstrip, Caná, 480 m, *Croat 37997* (MO). Cativo Swamp near Tusijuanda, 1 day up Río Balsa, *Duke 13533* (MO). San José River, *Duke & Bristan 397* (MO, NY). Between Paya and Palo de Los Letras, *Duke & Kirkbride 14030* (MO). Río Tuquesa, middle Tuquesa Mining Co. Camp called Charco Peje, *Mori 7057* (MO). From Paya to Pucro, *Stern et al. 225* (MO). Caná, *Stern et al. 693* (MO). PANAMÁ: Chimán, *Lewis et al. 3243* (MO, UC, VEN).

11. BOROJOA

Borojoa Cuatrecasas, Serie Bot. Aplicada, Serv. Divulg., Secr. Agric. y Ganad. (Calí, Colombia) 2(5): 474. Aug. 1949. (Preprint of Rev. Acad. Colombia Ci. 7: 474. 1950.) TYPE: *B. patinoi* Cuatrecasas.

Small dioecious *trees*. *Leaves* large, usually somewhat coriaceous, petiolate; stipules partly connate basally, interstipular, often persistent. *Inflorescences* terminal, pistillate flowers 6–8-merous; male flowers sessile, crowded, disposed in a terminal head; pistillate flowers usually terminal, solitary. Staminate *flowers* 4–5-merous; corolla hippocrateriform or funnelform, pubescent outside and within, the lobes contorted in bud; anthers 5, linear, dorsifixed; ovary 6–8-celled, the carpels united along their margins, the ovules numerous, the stigmas 6–8. *Fruits* baccate, large, rotund, the pericarp wall very thick; seeds embedded in a slimy pulp, disposed in rows, horizontally attached.

FIGURE 10. *Bertiera guianensis* Aubl.—A. Habit (×½).—B. Fruit (×3.5). [After *Stern et al. 693*.]

Borojoa is known from Panama, Colombia, Venezuela, and Brazil. It is a genus of about 8 species.

Literature:

Cuatrecasas, J. 1950. *Borojoa*, Nuevo Gen. Rubiaceae. Aug. 1949; Revista Acad. Colomb. Ci. Exact. 7: 474–477.

Patiño, U. M. 1950. Noticia sobre el Borojó, una nueva especie frutal de la costa Colombiana del Pacífico. Revista Acad. Colomb. Ci. Exact. 7: 478–489.

a. Lateral veins of leaves 6–12.
   b. Lateral veins of leaves 10–12; fruits to 6.5 cm in diam. ..... 1. *B. atlantica*
   bb. Lateral veins of leaves ca. 7; fruits to 4.5 cm in diam. ..... 2. *B. panamensis*
aa. Lateral veins of leaves 13–20 ..... 3. *B. patinoi*

1. **Borojoa atlantica** Dwyer.[8] TYPE: Panama, *Kennedy & Foster 2197* (MO, holotype).

Trees to 10 m tall, the branchlets terete, glabrous, the nodes well spaced. *Leaves* elliptic or obovate elliptic, 18–27 cm long, 6–13.5 cm wide, widely deltoid toward the apex, acuminate, the acumen triangular, 1–2 cm long, basally obtuse, cuneate or truncate, the costa lightly porcate above, prominent beneath, the lateral veins 10–12, arcuate, slender, the intervenal areas spreading reticulate, concolorous, drying green, thin coriaceous, glabrous above, minutely puberulent beneath; petioles 0.3–1.2 cm long, rigid or curved, puberulent; stipules (only one seen) connate?, ovate, to 1.3 cm long, ca. 0.5 cm wide, acute, subcoriaceous, puberulent. *Inflorescences* and flowers not seen. *Fruits* apparently sessile, rotund, to 6.5 cm in diam., lignose, lightly wrinkled on the surface, lightly puberulent, with many slender longitudinal grooves when dry, the wall thick, to 2 cm wide, the persistent calycine cup umbonate, to 1 cm long; seeds many, embedded in a fleshy pulp, subplane, often angular, to 1 cm long.

Borojoa atlantica is known only from Panama. It is readily distinguished from *B. panamensis* by the more numerous lateral veins of its leaves and it is from *B. patinoi* whose leaf blades have still more lateral veins (up to 20). The fruits of the new species and those of *B. patinoi* are similar.

Borojoa atlantica seems closely related to *B. universitatis* Steyermark, the type of which (*Aristequieta 6466*; US, isotype) is from the Parque Nacional de Guatopo, 650 m, Venezuela. The lateral veins of *B. universitatis* number about 18 and the wall of the large fruit (in the dried state) is only about 1 cm thick.

COLÓN: 2–3 miles up from the Río Guanche, *Kennedy & Foster 2197* (MO). PANAMÁ: El Llano-Cartí Road, *Folsom 2620* (MO); *Folsom & Collins 1517* (MO). Gorgas Memorial Labs, yellow fever research camp, Campamento Quatro, 5–10 km NE, Altos de Pacora, 600 m, *Mori & Kallunki 3336* (MO).

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[8] *Borojoa atlantica* Dwyer, spec. nov. *Arbores* ad 10 m altae. *Folia* elliptica vel obovato-elliptica, 18–27 (vel plus) cm longa, 6–13.5 cm lata, apicem versus lato-deltoidea acumine triangulari, 1–2 cm longo, basi obtusa cuneata vel truncata venis lateralibus 10–12, tenui-coriacea infra minuto-puberula supra glabra; petiolis ad 1.2 cm longis; stipulis fortasse ovatis, ad 1.3 cm longis. *Fructus* fortasse sessiles rotundi, ad 6.5 cm diam., pariete crasso, ad 2 cm lato, lignoso; seminibus multis in pulpa carnosa inclusis subplanis oblongis saepe angularibus, ad 1 cm longis.

2. **Borojoa panamensis** Dwyer, Phytologia 17: 446. 1968. TYPE: Panamá, *Duke & Lallathin 15014* (MO, holotype).

Small *trees*, the branchlets subterete, somewhat rimose, ultimately angular, presumably glabrous, the nodes to 9 cm apart, the scars of the petiole prominent, subrotund, ca. 0.4 cm in diam. *Leaves* elliptic rotund, to 19 cm long, to 12.5 cm wide, widely deltoid at apex, short acuminate, cuneate and subequilateral at base, the lateral veins ca. 7, arcuate, stiffly chartaceous, the lamina glabrescent, the costa with many minute golden hairs and the axils of the lateral veins golden barbate; petioles to 2 cm long, to 0.2 cm wide in middle; superior stipules persistent, connate to the middle, the sheath cylindrical, to 1 cm long, the triangular basal prominence to 6 mm long, ca. 0.5 cm wide, at maturity torn and reflexed, the free portions obovate rotund to elliptic, to 2 cm long, to 1 cm wide, acuminate, often wider above middle, thin coriaceous, dark brown, with many small veins and with a median keel. *Flowers* not seen. *Fruits* terminal, sessile, solitary, rotund, to 4.5 cm in diam., glabrous, minutely rugulose, the persistent calycine cup like a volcano's crater, to 0.5 cm long, the orifice ca. 0.4 cm wide.

The species is known only from the type locality in Panama.

Duke & Lallathin note on their collection that the fruits are "green, probably edible when ripe. Fruit, when sawed into, blackening as if possessed of genipine."

COCLÉ: Cerro Pilón near El Valle, ca. 2500 ft, *Duke & Lallathin 15014* (MO); *Lallathin 5014* (MO).

3. **Borojoa patinoi** Cuatrecasas, Nuevo Gen. Rubiaceae. Aug. 1949; Revista Acad. Colomb. Ci. Exact. 7: 474. 1950. TYPE: *Cuatrecasas 21137* (F, holotype).—FIG. 11.

Trees to 7 m tall, the branchlets smooth, plane, glabrous, the bark rimose, the nodes well spaced, to 6 cm apart, the pedicel scars often prominent. *Leaves* elliptic, to 36 cm long, to 17 cm wide, cuneate at the apex, basally cuneate, truncate or obtuse, the costa prominulous above, prominent beneath, to 1.8 mm wide, obviously porcate distally, the lateral veins 13–15, widely arcuate, to 3 cm apart, usually 1–1.5 cm apart, the venules pinnatiform, spreading, discolorous, subcoriaceous, glabrous; petioles to 4 cm long, glabrous; stipules tending to persist, often reflexed at maturity, connate, appressed to stem, the sheath cylindrical, the parts ovate elliptic to ovate, 2.5–4 cm long, to 1.2 cm wide, acute at the apex, stiffly chartaceous with a slender, median keel, venose, the veins crowded, prominulous. *Inflorescences* terminal, the male flowers numerous, disposed in a terminal head about equal to the petiole; bracts disposed as 2, connate, decussate pairs, soon spreading or reflexed; bracts subtending the solitary female flower, the inner pair suborbicular, the outer pair similar in size and texture to the stipules. Male *flowers* 4–5-merous, the hypanthium and the calycine tube tubular, 0.7–0.8 cm long, glabrous, stiffly membranous, truncate, the teeth absent or vague; corolla white, to 25 mm long, the tube hippocrateriform, to 18 mm long, thickly petaloid, densely sericeous outside, the lobes 5, 6–7 mm long, oblong, obtuse, somewhat shorter than the tube; stamens 5, the anthers linear, ca. 12 mm long, the filaments slender, short; female flowers 6–7-merous; style to 7 mm long, the stigmatic lobes 6, linear lanceolate, slightly longer than the style, acute, pap-

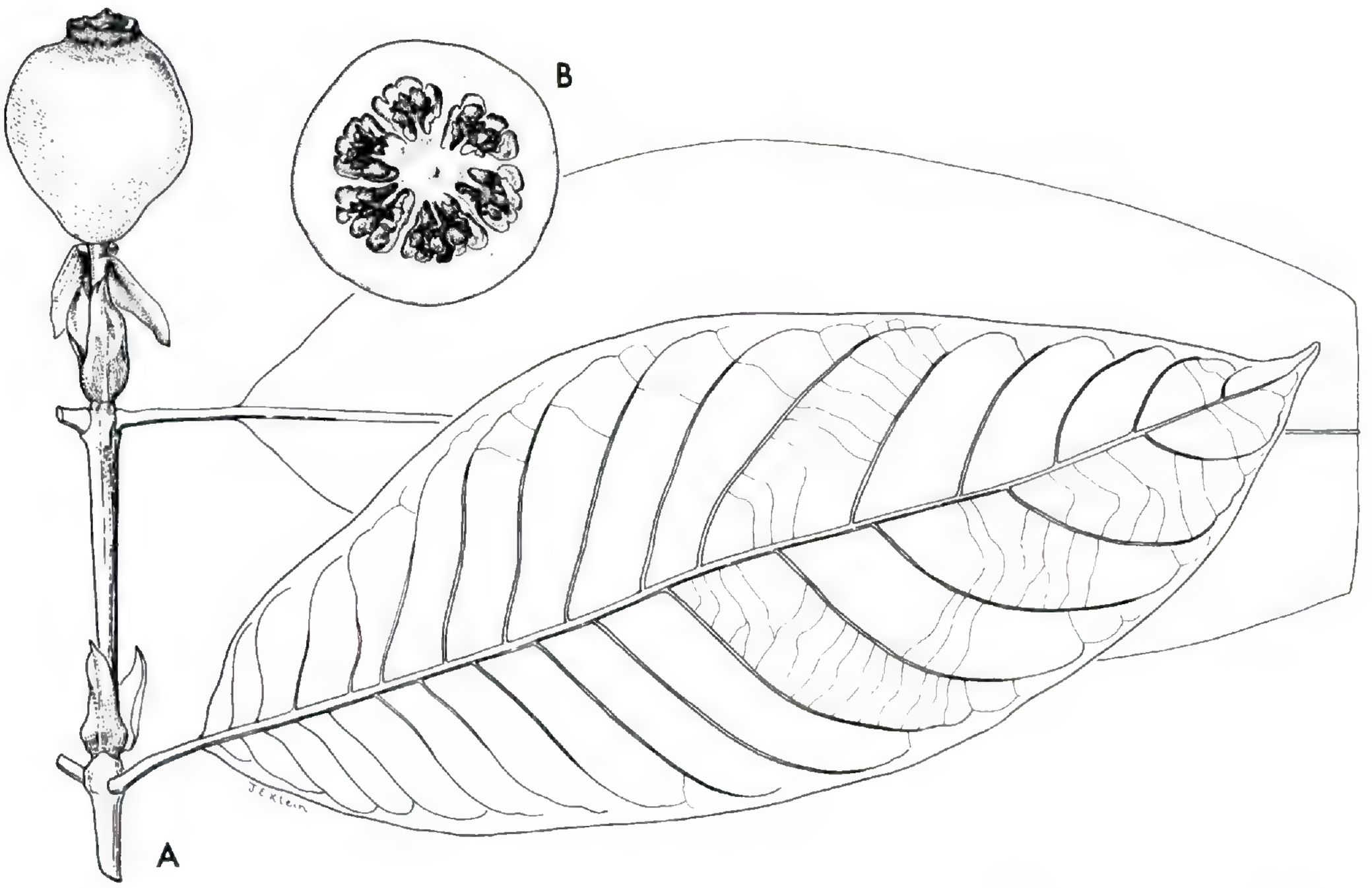

FIGURE 11. *Borojoa patinoi* Cuatrecasas—A. Branch with leaves and fruit (×.35). [After *Duke 14181.*]—B. Fruit cross section (×.35). [After *Kirkbride & Duke 407.*]

illose. *Fruits* sessile, rotund, applelike, 7–8 cm in diam., subtended by the persistent bracts, glabrous, the remains of the calyx represented by a delicate ring bordering a terminal cavity, ca. 1 mm deep, the wall very thick, 1.2 cm in diam.; seeds subplane, subovoid, 6–7 mm long, 7–12 mm wide, embedded in a pulp.

The above description has drawn freely on Cuatrecasas (1949) as the Panama collections are sterile with one exception and this is in bud.

Borojoa patinoi is known only from Panama and Colombia. "Borojo," "Borojo Hembra," "Borojo Macho," or "Burijo."

Duke in his *Darien Ethnobotanical Dictionary* states: "This favorite fruit tree, one fruit making a bowl of chicha, has followed the Choco (Indians) into Panama (from Colombia), in whose flora it is unreported." Duke adds, speaking of himself: "I am called Borojo among the Darien Choco, because for a while, I was distributing borojo seedlings like Johnny Appleseed." He adds that the fruits are edible, are aromatic, and take more than one year to ripen.

DARIÉN: Cerro Pirre, *Bristan 495* (MO). Santa Fé, *Duke & Bristan 310, 311* (both MO). Río Tucutí between Río Tucutí and Río Urugantí, *Duke 5280* (MO). Without specific locality, *Duke 8332* (MO). Finca Othon near Yape, *Duke 11820* (MO). Río Mortí, Drill Site 7, ca. 250 m, *Duke 14181* (MO). Río Punusa and Río Pucro, *Duke 14637* (MO). Río Paya, 20 minutes from mouth of Río Paya, *Kirkbride & Duke 407* (MO). SAN BLAS: Eslogandi, 200 m, *Duke 10196* (MO).

12. BORRERIA

Borreria G. F. W. Meyer, Prim. Fl. Esseq. 79: 1818. nomen conserv. contra *Borreria* Acharius (1810, Lichen). TYPE: *B. suaveolens* G. F. W. Meyer, type conserv.

Tardavel Adanson, Fam. Pl. 2: 145. 1763. TYPE: Rheede, 168. Hortus Indicus Malabaricus 9, *tab. 76.* (design. Standley 1916) = *Borreria articularis* (L.f.) F. N. Williams.
Borrera G. F. W. Meyer, Prim. Fl. Esseq. 79. 1818. orth. mut. Sprengel, Gen. 1: 93. 1830.

Herbs, annual or perennial, rarely suffrutescent. *Leaves* with the petioles united to the stipules forming a setiferous sheath. *Inflorescences* capitate, usually sessile, axillary or terminating the stem. *Flowers* with the calycine lobes 2 or 4, equal or unequal, often with interdental teeth, the corolla reduced, funnelshaped, the lobes 4, the stamens usually attached near the mouth; ovary 2 celled with an ascending ovule in each cell. *Fruits* capsular, coriaceous or membranaceous, 2-valved, the valves septicidally dehiscent; seeds 1 per cell.

Borreria occurs throughout the warmer parts of the world. It is a genus of about 150 species.

Literature:

Steyermark, J. 1972. 39. *Borreria* G. F. W. Meyer. The Botany of the Guayana Highland—Part IX. Mem. New York Bot. Gard. 23: 805–831.

a. Plants more than 1 dm tall.
  b. Inflorescences with heads 1.1–2.0 cm in diam.
    c. Leaves 0.1–0.25 cm wide or if wider, corolla lobes pilulose within ---------- 6. *B. suaveolens*
    cc. Leaves 0.6–3.2 cm wide.
      d. Leaves 2 at a node, corolla lobes pilulose within; stipular sheaths pubescent ---------- 2. *B. laevis*
      dd. Leaves 5–6(–8) at some of the nodes, corolla lobes not pilulose; stipular sheaths glabrous ---------- 1. *B. densiflora*
  bb. Inflorescences with heads (0.3–)0.5–1.0 cm wide.
    e. Inflorescences with heads axillary, or if terminal heads present, these much reduced in diam.; stems villose; leaf blades usually drying yellow green or flushed with red ---------- 3. *B. latifolia*
    ee. Inflorescences with heads both terminal and axillary, similar in diam.; stems glabrate; leaf blades not drying yellow green or flushed with red.
      f. Leaves 2 at a node.
        g. Leaves 0.3–1.0 cm wide; corolla ca. 1 mm long; fruits with one carpel with 2 calycine lobes ---------- 4. *B. ocimoides*
        gg. Leaves (0.6–)1.0–3.0 cm wide; corolla ca. 2.5 mm long; fruits with one carpel with 3 of the 4 calycine lobes ---------- 2. *B. laevis*
      ff. Leaves 5–6 at some of the nodes ---------- 1. *B. densiflora*
aa. Plants less than 0.6 dm tall.
  h. Leaves to 6 mm long ---------- 5. *B. pumilio*
  hh. Leaves 10–25 mm long ---------- 4. *B. ocimoides*

1. **Borreria densiflora** DC., Prodr. 4: 542. 1830. TYPE: Jamaica, *Swartz*, not seen.

Spermacoce spinosa L. Sp. Pl., ed 2. 148. 1762, nomen illegit. (cites *S. suffruticosum* Loefl.; see Steyermark 1972).
S. spinosa Swartz., Obs. Bot. 45. 1791, not Jacq. 1760, nomen nudum.
S. spinosa Cham. & Schl., Linnaea 3: 340. 1828.
Tardavel spinosa (L.) Standley, Contr. U.S. Natl. Herb. 18: 122. 1916.
B. radicosa Brandegee, Univ. Calif. Publ. Bot. 10: 416. 1924. TYPE: Mexico, *Brandegee 9223* (CAL, not seen).

Herbs to 0.5 m tall, the stems arising from a taproot, erect, decumbent or prostrate, often the branches restricted basally and strict, occasionally with short branches above, angular, smooth, glabrous or puberulent, the nodes well spaced.

Leaves 5–8 at some of the nodes, of variable length, some 3 times longer than others, linear lanceolate to linear, to 6 cm long, to 0.8 cm wide, acute at the apex, attenuate at the base, the costa prominent beneath, the lateral veins few and scarcely distinguishable, papyraceous, stiff, smooth, the costa often with scattered erect calcareous bodies, the margin scabrid, revolute; petioles absent or seemingly present as the blades attenuate basally, the setiferous sheath cupuliform, 2–4 mm long, the setae 15–20 linear, as long as or longer than the sheath. *Inflorescences* subtended by 4–8 leaves, terminal or axillary in upper axils, the heads sessile, 1.5–2.0 cm in diam. with slender, white bristles among the flowers. *Flowers* with the hypanthium oblong, the calycine cup ca. 0.3 mm long, petaloid, glabrous, the calycine teeth 2, subulate or linear oblong, 1.3–1.8 mm long; corolla white, cupular, 1.5–2.0 mm long, strongly constricted basally, the lobes 4, lanceolate or oblong, to 1 mm long; stamens 4, exserted, the anthers oblong rotund, 0.3–0.5 mm long, the filaments slender, to 0.5 mm long, the style 1.3–1.7 mm long, the stigmatic lobes minute. *Fruits* pyriform or obovate oblong, the 2 carpels to 2.5 mm long, somewhat compressed, smooth, shiny, glabrous except pubescent to arachnoid pubescent at the apex, the 2 awns erect, shorter than the body of the fruit, pubescent.

This species is widely distributed throughout tropical America. For an elaborate discussion of "*Borreria densiflora* DC. (as) the earliest legitimate name for the species now passing as *B. spinosa*," see Steyermark (1972) p. 814.

BOCAS DEL TORO: Junction Ríos Changuinola and Teribe, *Lewis et al. 923* (GH, MO, US). Isla Colón, *Wedel 2946* (MO). CANAL ZONE: Fort Lorenzo, *Baker & Oliver 1043* (GH, K, MO, UC, US). Panamerican Highway, La Chorrera, *D'Arcy 9452* (MO). Toro Point, Fort Sherman, *Duke 4324* (MO). Fort Sherman, *Dwyer 7191* (MO). Between Rodman Marine Base and Chorrera, *Nowicke et al. 3606* (MO, SCZ, UC). Fort Amador, *Tyson 2017* (MO). Fort Sherman, *Tyson 2248* (MO). BARRO COLORADO ISLAND: *Croat 4407, 6984, 7394, 12609, 12884* (all MO); *Shattuck 421* (MO). CHIRIQUÍ: Methodist Camp near Nueva Swissa, *Croat 13525* (MO). Burica Peninsula, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22181* (MO). Llanos Francia, 4 mi from Boqueté, *Dwyer & Hayden 7612* (MO). Cerro Punta and Bambito, *Wilbur et al. 10902* (MO). Cerro Punta and Las Nubes, *Wilbur et al. 13233* (MO). COLÓN: Mouth of Río Piedras, *Lewis et al. 3176* (MO). HERRERA: Salinas de Chitre on Bahia Parita, *Croat 9683* (MO). Between Río Bayano Dam and Cañitas, *D'Arcy 9400* (MO). PANAMÁ: Isla Taboga, *Allen 1272* (MO). Punta Chame, *D'Arcy 10234* (MO). San José Island, *Johnston 838* (MO). 2 km W of El Llano, *Nee 7958* (MO). Nuevo Emperador, *Troetsch 8* (MO). SAN BLAS: Mandingo Airport, *Duke 14824* (MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al. 2766* (COL, MO, UC, VEN). 2 km NW of Atalaya, *Nee 8234, 8243* (both MO).

2. **Borreria laevis** (Lam.) Griseb.,[9] Goett. Abh. 7: 231. 1857.—FIG. 12.

Spermacoce laevis Lam., Tabl. Encycl. Méth. 1: 273. 1791. TYPE: Santo Domingo, W.I., not seen.
Spermacoce echioides H.B.K., Nov. Gen. Sp. Pl. 3: 269. 1820. TYPE: not seen.
Tardavel laevis (Lam.) Standley, Contr. U.S. Natl. Herb. 18: 122. 1916.
Spermacoce guianensis Brem., Recueil Trav. Bot. Néerl. 33: 714. 1936. TYPE: Surinam, *Rombouts 75* (Utrecht?).

Herbs, upright or scandent, to ⅔ m in length, the stems smooth or rimose, glabrous to glabrate, often retrorse pilose, the nodes well spaced. *Leaves* ovate elliptic to elliptic, 1.5–7.0 cm long, 0.6–3.0 cm wide, acute at the apex, rounded at the base, occasionally attenuate acute, often inequilateral, the costa prominulous beneath, the lateral veins 5–6, strongly arcuate, chartaceous, concolorous,

[9] For more complete synonymy see Steyermark (1972) p. 819.

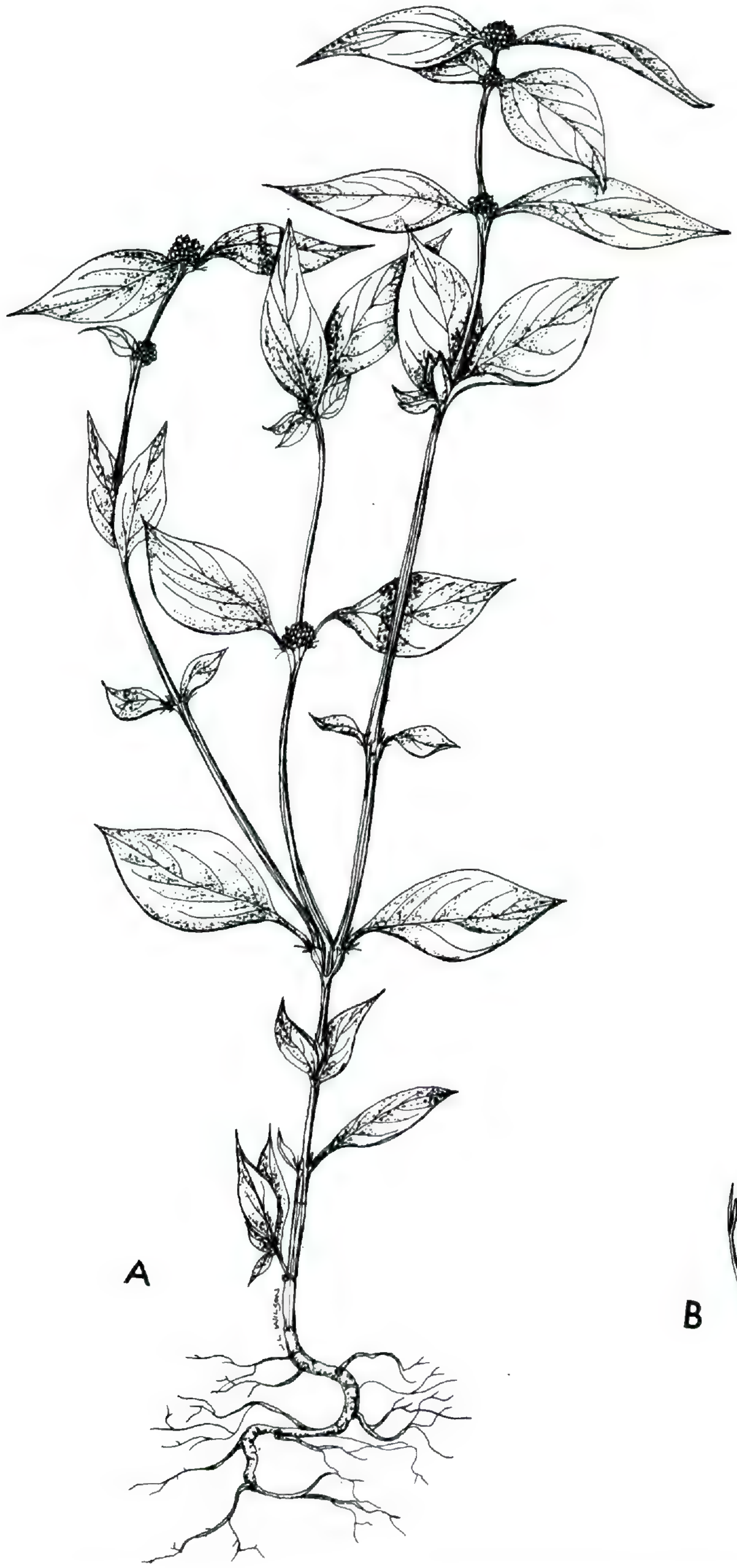

FIGURE 12. *Borreria laevis* (Lam.) Griseb.—A. Habit (×⅓).—B. Fruit (×8). [After *Duke 4902*.]

scabrous above and beneath, glabrous above, glabrate beneath; petioles to 1 cm long; stipules connate, the base of the petiole adnate to the sheath, the latter cylindrical, appearing to be subnodal, to 4 mm long, puberulent to villosulose, the awns several, narrowly subulate, 2–7 mm long. *Inflorescences* axillary and terminal, globose capitate, 0.6–1.0 cm in diam. *Flowers* with the hypanthium glabrous or puberulent, oblong, ca. 1.5 mm long, the calycine teeth 4, unequal, subulate, to 0.5 mm long, ciliolate; corolla cylindrical, 2.5 mm long, the lobes 4, longer than the tube, pilose within; stamens 4–5, the anthers subrotund, ca. 0.3 mm long, the filaments 1.3 mm long; style to 2 mm long, the stigmas rotund capitate, ca. 0.25 mm in diam. *Fruits* oblong, 1–2 mm long, glabrous to minutely pubescent, dehiscent, one carpel bearing 3 of the 4 calycine lobes; seeds oblong, 1.0–1.5 mm long, 0.75 mm wide, the transverse grooves prominent.

Borreria laevis is a common weed in Central America and in most of South America. It also occurs in the West Indies. "Sab Tutu" (Cuna, *Duke 14439*).

BOCAS DEL TORO: Isla Bocas del Toro, *Durkee 71-155* (MO). Without other locality, *Wedel 243* (MO). Water Valley, *Wedel 595, 991* (both MO). Isla Colón, *Wedel 2833* (MO). CANAL ZONE: Fort Amador, *D'Arcy 9328* (MO). Between Rodman Marine Base and Chorrera, *Nowicke et al. 3585* (MO, SCZ, UC). Ancón Hill, *Seibert 107* (MO). Fort San Lorenzo, *Tyson & Blum 3701* (MO). Ancón Hill, *Woodson et al. 1325* (MO). Salamanca Hydrographic Station, *Woodson et al. 1617* (MO). BARRO COLORADO ISLAND: *Croat 4045, 4188, 4644, 5796, 6078, 6946, 7047, 7060, 7064, 7322, 9199* (all MO); *Ebinger 48* (MO); *Hayden 81* (MO); *McDaniel 5025* (MO); *Netting 49* (F); *Shattuck 478* (MO); *Starry 26, 74* (both MO). CHIRIQUÍ: N of Cerro Punta, *Croat 10448, 10471, 10508* (all MO). 1 mi N of El Hato del Volcán, *Croat 10703* (MO). Road to Río Serano, *Folsom et al. 2093* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 630* (GH, K, MO, NY, US). 11 mi W of Puerto Armuelles, *Liesner 82* (MO). Puerto Armuelles, *Liesner 140* (MO). Upper Río Chiriquí Viejo, Monte Lirio, *Seibert 247* (MO). COCLÉ: Behind Club Campestre, *Duke 13273* (MO). NE of El Valle, *Lewis et al. 1698* (MO, UC). Between Las Margaritas and El Valle, *Woodson et al. 1288* (MO). COLÓN: Ridge behind Garotte, *D'Arcy 9332* (MO). Achiote, Zimmerman, *Folsom et al. 3322* (MO). DARIÉN: Boca de Cupe, *Allen 984* (MO). El Real, *Burch et al. 1076* (COL, MO, UC). S of El Real, *Duke 4902* (MO). From Pucro to Río Pucro, *Duke 5375* (MO). 10 mi S of El Real on Río Pirre, *Duke 5444* (MO). 1–4 mi N of Pucro, *Duke 13019* (MO). Río Pucura between Cerro Mali and Cerro Tacarcuna, near Río Pucro base camp, 640 m, *Gentry & Mori 13951* (MO). Paya, *Stern et al. 259* (MO). LOS SANTOS: Loma Prieta, *Duke 11863, 11895* (both MO). 25 mi SW of Tonosí, *Lewis et al. 2983* (MO, UC). PANAMÁ: Near Jenené, *Duke 3831, 3847* (both MO). Piria, ca. 150 m, *Duke 14439* (MO). 3 mi E of El Llano, *Tyson 1723* (MO). Road to Cerro Campana, 7.6 km from Panamerican Highway, *Witherspoon & Witherspoon 8366* (MO). SAN BLAS: SE of Puerto Obaldía, *Croat 16736* (MO). Puerto Obaldía, *Gentry 1555* (MO).

3. **Borreria latifolia** (Aubl.) Schum. in Mart., Fl. Bras. 6(6): 61. 1888.

Spermacoce latifolia Aubl., Hist. Pl. Guiana 55. 1775. TYPE: Cayenne, French Guiana, *Aublet*, not seen.
Borreria perrottetii DC., Prodr. 4: 548. 1830. TYPE: not indicated.
Tardavel latifolia (Aubl.) Standley, Contr. U.S. Natl. Herb. 18: 122. 1916.

Herbs, often prostrate, often erect and more than 1 m tall, the stems villose, porcate, the nodes well spaced. *Leaves* with the blades often spreading, disposed at right angles to the stem or deflexed, trapeziform, ovate oblong, oblong rotund or oblong, 1.5–6.0 cm long, 0.7–3.2 cm wide, acute at the apex, the costa prominulous beneath, the lateral veins ca. 5, immersed above, prominulous beneath, chartaceous, scabrous, often with white bulbous-based hairs above, drying yellow green or flushed with red; petioles absent or to 0.5 cm long; stipules with the sheath subtriangular in outline, often split as the inflorescence expands, the setae to 5 mm long. *Inflorescences* with the flowers disposed in rotund heads in the

axils, these usually to 1 cm wide. *Flowers* with the hypanthium short, ca. 1 mm long, densely appressed white villose to glabrous (fide Standley), the calycine cup much shorter than the lobes, the lobes 4, lanceolate to ovate, to 1.5 mm long, acute, villose; corolla white, the tube funnelshaped, 2.5–3.0 mm long, glabrous, the lobes 4; stamens 4, the anthers oblong or ovate, 0.35–0.50 mm long, the filaments at least twice as long as anthers, attached at the mouth; style minute, knoblike or conspicuously bifid, the ovarian disc scarcely developed. *Fruits* oblong or turbinate, to 3 mm long, densely villose, opening apically and often expanding into 2 valves, each valve circular in top view, the smooth light-colored interior of the valve revealed; seeds oblong, ca. 2 mm long, smooth, drying orange, shiny, reticulate, the calyx tending to wither at dehiscence.

Borreria latifolia is widely distributed in tropical America. It also occurs in the West Indies. "Cansa-mozo" (Standley, 1928).

Steyermark (1972) has 2 varieties and several forms which do not hold up as far as the Panamanian material is concerned. In the synonomy of *B. latifolia* I have included only a minimum of synonomy as compared with Steyermark's many synonyms.

CANAL ZONE: Panamerican Highway near La Chorrera, *D'Arcy 9432, 9453* (both MO). Ft. Kobbe, *Duke 3905* (MO). E of Gatún Locks, *Duke 4306* (MO). 5–9 mi N of Gamboa, *Gentry 2408* (MO). Chiva-Chiva Trail, *Tyson 1370* (MO). Curundú, *Tyson 6288* (MO). Miraflores Lake, *White 253* (MO). BARRO COLORADO ISLAND: *Croat 5982, 6461, 12816, 12824* (all MO). CHIRIQUÍ: Palo Alto, E of Boquete, *Stern et al. 1042* (MO). COLÓN: Sardinilla, 7–8 mi E of cement plant, *Blum & Tyson 497* (MO). 0.7 mi NE of Río Piedras, *Nee & Mori 3641* (MO). PANAMÁ: Arraijan, *Duke 4681* (MO). Cerro Jefe, *Gentry 2138* (MO). San José Island, *Johnston 434, 1085* (both MO). Goofy Lake, *Lewis et al. 229* (GH, MO, UC, US). Chimán, *Lewis et al. 3306* (MO, PAN). El Llano-Cartí Road, 5 km N of Panamerican Highway, *Nee 7879* (MO). VERAGUAS: 1–2 mi above Santa Fé, *Gentry 3063* (MO).

4. **Borreria ocimoides** (Burm. f.)[10] DC., Prodr. 4: 544. 1830.

Spermacoce ocimoides Burm. f., Fl. Ind. 34. 1768. TYPE: Tropical Asia.
Borreria parviflora G. F. W. Mey., Prim. Fl. Esseq. 83. 1818. TYPE: not seen.
B. tampicana DC., Prodr. 4: 544. 1830, in part. TYPE: Mexico, *Berlandier 37 bis* (?B, not seen; photo, MO).
B. pringlei Wats., Proc. Amer. Acad. Arts 25: 152. 1890. TYPE: *Watson 2464* not seen.
Tardavel ocymoides (Burm.) Heirn, Cat. Pl. Welw. 2: 503. 1898.

Terrestrial *herbs*, often procumbent, rarely epiphytic on tree roots, to ⅓ m tall, the stems simple or branched, angular, delicately alate, glabrous, the nodes well spaced. *Leaves* lance ovate or ovate trapeziform, 1.0–2.5 cm long, to 1 cm wide, acute or occasionally obtuse at the apex, basally acute to cuneate, the costa immersed, the lateral veins 4–5, strongly arcuate ascending, concolorous, scabrous above and beneath; petioles absent or to 0.15 cm long; stipules connate and adnate to the base of the petiole, the sheath cupshaped, scarcely measurable, to 1.5 mm long, the setae 6–10, to 2.5 mm long, usually curled. *Inflorescences* terminal and axillary, sessile, capitate, 0.2–0.8 cm wide. *Flowers* minute, the calycine lobes 2–3(–4), erect, subulate, ca. 1 mm long; corolla white, to 1 mm long, the lobes 4, acute; stamens 4, the anthers minute. *Fruits* capsular, the

[10] For more extensive synonymy see Steyermark (1972). Only these names have been used for Panamanian material.

valves 2, splitting and separating, the persistent calycine lobes glabrous or puberulent; seeds oblong, ca. 1 mm long, brown, reticulate.

Borreria ocimoides is a widespread weed in the tropics.

CANAL ZONE: Military Road, K-9, *Ebinger 513* (MO). Gaillard Highway, ½ km NW of Summit Garden, *Nee 6929* (MO). Salamanca Hydrographic Station, *Woodson et al. 1619* (MO). BARRO COLORADO ISLAND: *Croat 8268, 8303, 8826, 10396, 11339, 12277, 12582, 12938, 13152, 17037* (all MO); *Shattuck 47, 497* (both MO). CHIRIQUÍ: Districto Guanabano, along Quebrado Quanabano, *Croat 22510* (MO). Boquete, 3300–4200 ft, *Davidson 597* (MO); *Lewis et al. 334* (GH, K, MO, NY, UC, US); *Partch 69–76* (MO); *Woodson & Schery 729* (MO). Cerro Punta, 6000 ft, *Tyson 7128* (MO). COCLÉ: El Valle, *Allen 2825* (MO). La Mesa, *Gentry 6826* (MO). DARIÉN: El Real, Río Tuira, *Stern et al. 774* (MO). PANAMÁ: Between Panamá and Chepo, *Dodge et al. 16698* (MO). Hacienda la Joya, *Dodge et al. 16891* (MO). Cerro Campana, road near summit, *Duke 6000* (MO). Confluence Río Pacora and Río Corso, ca. 450 m, *Duke 11957* (MO). Goofy Lake, *Dwyer 7137* (MO). San José Island, *Johnston 902* (MO). Cerro Campana, *Lewis et al. 3103* (COL, DUKE, F, K, MO, NY, UC). W slope of Cerro Campana 2500 ft, *Tyson et al. 2349* (MO). 2 mi S of Tocumen Airport, *Tyson & Clewell 5929* (MO).

5. **Borreria pumilio** Standley, Ann. Missouri Bot. Garden 27: 342. 1940. TYPE: Panamá, *Allen 822* (F, holotype, isotypes MO, NY, US).

Herbs to 6 cm tall, unbranched or with 1–2 branches, the stem with appressed white hairs. *Leaves* sessile, linear oblong, 4–6 mm long, the costa and veins not visible or the lateral veins 4–5, scarcely visible beneath, arcuate, granulose above and beneath; stipular sheath ca. 1 mm long, the setae several, to 1 mm long. *Inflorescences* capitate, terminal or in the uppermost axils, the heads ca. 0.5 cm in diam., the outermost bracts linear, to 9 mm long. *Flowers* with the corolla white, the tube somewhat longer than the calycine lobes. *Fruits* subrotund, each mericarp oblong, ca. 0.8 mm long, the persistent calycine lobes 1.0–1.5 mm long, glabrous to pubescent, usually slightly longer than the body of the fruit.

Borreria pumilio is known only from Panama. Because of the scant material, the description of flowers is taken from Standley's diagnosis.

CANAL ZONE: Fort Kobbe, Curatella Savanna, *Duke & Mussell 6573* (MO). COCLÉ: Natá, *Allen 822* (F, MO, NY, US).

6. **Borreria suaveolens** G. F. W. Meyer, Prim. Fl. Esseq. 81. 1818. TYPE: Surinam, in Arenosis Continentis Circa Arouabischkreck, *Meyer*, not seen.

B. tenella Cham. & Schlecht., Linnaea 3: 317. 1828. TYPE: Brazil, *Sello*, not seen.
B. tenella var. *suaveolens* (Meyer) Schum., Mart., Fl. Bras. 6: 56. 1888.
B. capitata var. *suaveolens* (Meyer) Steyermark, Mem. N.Y. Botanical Garden 23: 825. 1972.

Perennial *herbs*, smaller plants somewhat ericoid in habit, the stems often arising from a taproot, frequently unbranched to the apex, densely pubescent to glabrate, the nodes well spaced. *Leaves* sessile or subsessile, 2(–6) at a node, the shorter leaves linear or narrowly ovate lanceolate, 2–6(–8) cm long, to 0.25(–0.5) cm wide, occasionally falcate, acute at the apex, rounded or obtuse at the base, the costa prominent beneath, the lateral veins ca. 4, strongly ascending, usually obscure, stiffly papyraceous, usually scabrid, the margins revolute; stipules with or without a distinct sheath, the latter to 2 mm long, with 4–8 setae on each side, these 3–5 mm long, rubescent. *Inflorescences* globose capitate, the heads ter-

minal, axillary in the 2 superior nodes, to 1 cm in diam., the leaflike bracts reflexed in older heads, the bracts densely aggregated in the head, linear subulate, 3.5 mm long. *Flowers* with the corolla funnelshaped or subcylindrical, 3.5 mm long, glabrous outside; stamens 4, the anthers oblong, ca. 1 mm long, the filaments 1.2–1.5 mm long, attached above the middle of the tube; style slender, 2–3 mm long, the stigmatic area minute, capitate, ca. 0.2 mm long. *Fruits* oblong, 1.5–2.0 mm long, the calycine lobes often persistent, as long as the body of the fruit, the latter splitting at the pubescent apex; seeds not sulcate.

Borreria suaveolens is well distributed throughout tropical America; it is a common species in savannas from low to relatively high elevations.

CANAL ZONE: Río Indio, *Allen 17395* (MO). Drowned Río Azote Caballo, *Dodge et al. 16833* (MO). Río Indio, *Dodge & Allen 17377* (MO). Ancón Hill, *Standley 26206* (MO). CHIRIQUÍ: Volcán de Chiriquí, *Allen 989* (MO). S of Boqueté, *Allen 4691* (MO). 1 mi N of El Hato de Volcán, *Croat 10700* (MO). Cerro Colorado, 20–28 mi from San Félix, 1200–1500 m, *Croat 33385* (MO). Boquete, *D'Arcy 9773B* (MO). El Barú above Boquete, 1200–1800 m, *D'Arcy 9928* (MO). Lava flow between El Hato and Bambito, *D'Arcy 10025* (MO). Boquete, *Davidson 682* (MO). 3 km NE of El Hato del Volcán, 1500–1800 m, *Davidse & D'Arcy 10383* (MO). Volcán, *Duke 9153, 9184* (both MO). Llanos Francia, near Boquete, *Dwyer s.n.* (MO). ¼ mi S of Bambito, *Lazor & Correa A. 2700* (MO). Volcan Barú, ca. 2000 m, *Mori & Bolten 7385* (MO). Boquete, *Partch 69-37* (MO). Llanos Francia, *Stern et al. 1155* (MO). Cerro Punta, ca. 6000 ft, *Tyson 7128* (MO). Río Chiriquí Viejo Valley, El Volcán, *White 209* (MO). PANAMÁ: Río Pacora and Chepo Highway, *Duke 5925, 5926* (both MO). Cerro Campana, *Ebinger 364* (MO); *Sullivan 436* (MO); *Tyson et al. 2383* (MO). Río Tartaré, *Woodson & Schery 1009* (MO). VERAGUAS: Soná, *Allen 1050* (MO).

13. BOUVARDIA

Bouvardia Salisbury, Parad. Lond. *pl. 88*. 1807. TYPE: *B. triphylla* Salisbury.

Aeginetia Cav., Anales Ci. Nat. 3: 129. 1801; Ic. 6: 51. 1801, not *Aeginetia* L. (1753).

Shrubs or *herbs*. *Leaves* opposite or 3–4(–6) per node, membranous; stipules interpetiolar with a basal sheath. *Inflorescence* terminal, cymose. *Flowers* dimorphic, calycine lobes 4, persistent; corolla tubular or salverform, the lobes 4, valvate; stamens 4, the anthers linear or oblong, in pin flowers included and subsessile, in thrum flowers included and with filaments distinct and exserted; styles of 2 lengths, usually slender, the ovary 2-celled, the ovules numerous, attached peltately to a complete septum. *Fruits* capsular, globose or oblate, dehiscing at first loculicidally, then septicidally; seeds numerous, vertically imbricate, winged, the wing entire.

Bouvardia, a genus of about 50 species, ranges from Mexico to Panama.

Literature:

Blackwell, W. H. 1968. Revision of *Bouvardia*. Ann. Missouri Bot. Gard. 55: 1–30.

1. **Bouvardia glabra** Polak., Linnaea 41: 565. 1877. TYPE: *Polakowsky 337* (F, frag. holotype, photo F, US).—FIG. 13.

B. glabra var. *gracilis* Polak., Linnaea 41: 566. 1877. TYPE: *Polakowsky 172* (not seen; F, photo).
B. glabra var. *obtusa* Loesner, Verh. Bot. Ver. Brandenberg 65. 106. 1923. TYPE: *Seler 2920* (not seen).

FIGURE 13. *Bouvardia glabra* Polak. Flowering branch (×.94). [After *Mori & Bolton 7356.*]

Shrub to 1½ m tall, the branchlets smooth, glabrous, drying tan. *Leaves* tending to persist at the apex of the twiglets, ovate lanceolate to widely elliptic, 3.5–5.0 cm long, 1–2 cm wide, acute at the apex, acute at the base, the costa subplane above and beneath, the lateral veins 3–6, strongly ascending and arcuate, glabrate, chartaceous, discolorous, brown above, greenish beneath; petioles slender, to 3 mm long; stipules triangular with 3–5 subulate processes, the median process more elongate, often longer than the body. *Inflorescences* 3–7-flowered. *Flowers* pedicellate, the pedicels to 1.5 cm long; hypanthium glabrous,

drying dark, the teeth 4, falcate subulate, unequal, 3–7 mm long; corolla tube cylindrical, to 2 cm long, to 0.2 cm wide in the middle, glabrous outside, sparsely pilose above the middle, the lobes ovate oblong, to 5 mm long, to 4 mm wide, obtuse; anthers (? all) subsessile, 3 mm long, ca. 1 mm wide, obtuse; style (only longer styles seen) to 2.3 cm long, the stigmas to 4.5 mm long. *Fruits* on pedicels to 1.7 cm long, to 0.7 mm wide, glabrous, compressed rotund, to 0.8 cm long, glabrous.

Bouvardia glabra ranges from southern Chiapas, Mexico, to Guatemala, Costa Rica and Panama.

CHIRIQUÍ: W side of Volcán Barú, oak forest, 2000–2500 ft, *Mori & Bolten 7356* (MO).

14. CALYCOPHYLLUM

Calycophyllum DC., Prodr. 4: 367. 1830. LECTOTYPE: *C. candidissimum* (Vahl) DC. (*Macrocnemum candidissimum* Vahl).

Enkylista Benth. Hooker's J. Bot. Kew Gard. Misc. 5: 230. 1850. TYPE: *E. spruceana* Benth.

Trees. *Leaves* petiolate, the stipules small, deciduous. *Inflorescences* paniculate, terminal, corymbose, ebracteolate or bibracteolate. *Flowers* in bud enclosed by membranous bracts, sessile or subsessile, the hypanthium oblong, the calycine cup truncate, sometimes partly expanded into a large foliaceous stalked blade, the corolla with the tube short, funnelform, the mouth villous, the lobes 6–8, imbricate or contorted, 1 lobe exterior, the stamens exserted, the anthers versatile, the filaments subulate, the style slender, the stigmas 2, narrowly oblong, the ovules disposed in 2 cells, numerous, imbricate, the placentas adnate to the septum. *Fruits* capsular, oblong cylindrical, 2-celled, septicidally bivalvate, the valves coriaceous; seeds numerous, imbricate, usually minute, the testa membranous, produced at each end as an elongate wing.

Calycophyllum has approximately 6 species in the West Indies and 1 in Central America and South America.

1. **Calycophyllum candidissimum** (Vahl) DC., Prodr. 4: 367. 1830.—FIG. 14.

Macrocnemum candidissimum Vahl, Symb. Bot. 2: 3. 1791. TYPE: not seen.
Mussaenda candida Poir. in Lam. Encycl. Méth. Bot. Suppl. 4: 395. 1797. TYPE: not seen.
Mussaenda candissima (Vahl) R. & S. Syst. Veg. 5: 251. 1819.

Trees to 15 (–40) m tall, the bark reddish brown, often exfoliate, the twiglets smooth, glabrous, rubescent. *Leaves* oblong rotund, obovate oblong and occasionally falcate, to 15 cm long, to 7 cm wide, obtuse at the apex, cuspidate, the cusp usually triangular, to 2.5 cm long, ca. 0.3–0.5 cm wide in the middle, basally attenuate cuneate or widely cuneate, often slightly inequilateral, the costa plane or immersed above, prominulous beneath, the lateral veins 8–10, arcuate, the intermediate veins parallel and branching near the margin, the intervenal areas spreading reticulate, papyraceous, often drying red brown, glabrescent or villosulose above and beneath, rarely with minute white raphides; petioles 3 (–4) cm long, slender, to 1.3 mm wide; stipules deciduous, oblong, ca. 2.5 cm long, obtuse, scarious, rubescent, villose. *Inflorescences* terminal (sometimes appearing axil-

FIGURE 14. *Calycophyllum candissimum* (Vahl) DC.—A. Habit (×2/5).—B. Opened flower and leaf (×2).—C. Ovary cross section (×4). [After *Miller 1962*.]

lary), paniculate, rarely shorter than the uppermost leaves, often flat topped or convex at the apex, to 20 cm long, usually with 3–4 peduncles arising from the tip of the twiglet, these strongly ascending, each with several strongly ascending branches, the flowers disposed in compound dichasia, the median flower of each cluster sessile. *Flowers* with the hypanthium turbinate, ca. 3 mm long, ca. 1.5 mm wide, truncate, glabrescent or villosulose with farinose glandular dots interspersed, the calycine cup less than 1 mm long, the teeth absent or often one expanded into a petiolate lamina, obovate spatulate, the blade to 3.3 cm long, to 2.5 cm wide, petaloid, glabrous, venose, the claw slender, ca. 0.2 cm wide; corolla white, the tube compressed cylindrical, ca. 3.3 mm long, densely villose within

above the middle, the lobes 5, strongly reflexed, oblong, 3–4 mm long, obtuse, glabrous, venose; stamens 5, the anthers oblong, ca. 1.5 mm long, subversatile, the filaments slender, elongate, to 3 mm long, exserted, attached at the mouth; ovarian disc pulviniform, pubescent, 0.75–1 mm long, 0.4–0.6 mm wide, the style 3.3–5.3 mm long, ca. 0.15 mm wide, the stigmas 2, slender, ca. 2.2 mm long, curved or erect, puberulent, the ovary rotund in cross section, 2 loculate, the septum moderately thick, the ovules numerous. *Fruits* sessile or subsessile, oblong, 0.5–1 cm long, truncate or rounded apically, usually obtuse or rounded at the base, lignose, villosulose, often with minute white raphides, drying tan, with ca. 8 delicate ribs, splitting from the apex, the margins of the valves wide; seeds to 5 mm long, the wing acuminate at each pole.

Calycophyllum candidissimum is widely distributed in Mexico and Central America, ranging south to Colombia and Venezuela. It also occurs in the West Indies. The hard, fine-grained wood has a variety of uses. In Panama it is used for charcoal. Standley (1928, p. 355) lists 5 common names: "Alazano," "Guayabo," "Harino," "Madroño," and "Salamo."

CANAL ZONE: Albrook, *Blum 2086* (MO). Chagres River, Boyd-Roosevelt Highway, *Blum & Tyson 1981* (MO). Madden Dam, *Dodge et al. 16500* (MO); *Dwyer 8380* (MO); *Lewis et al. 35* (F, GH, K, MO, NY, UC, US). Gatún, *Johnston 1736* (MO). Boy Scout Camp Road, Madden Dam, *Mori 4047* (MO). 1 km S of Madden Dam, *Nee 8905* (MO). Rodman Naval Ammunition Depot, 1 mi SW of Cocolí, *Wilbur et al. 12891* (MO). BARRO COLORADO ISLAND: *Aviles 60* (F); *Croat 8661, 12905* (both MO). COCLÉ: El Valle, *Aguilar* (MO). Río Mata Ahogado, *Allen 126* (MO). Cerro Pilón, *Lallathin 113* (MO). DARIÉN: Santa Fé, Río Sabanas, *Duke 10226* (MO). Punta Garachiné, *Duke 10472* (MO). Hydro Pico, Pico Pendejo, Río Sabanas, *Duke 15434* (MO). Río Chucunaque between Yaviza and junction with Tuira, *Gentry & Mori 13483* (MO). Campamento Buena Vista, Río Chucunaque, *Stern et al. 966* (MO). Piriaque Camp, *Tyson et al. 4761* (MO). LOS SANTOS: Tonosí, *Duke 12486* (MO); *Oliver et al. 3544* (MO); *Stern et al. 1816* (MO). PANAMÁ: Pacora, *Allen 1122* (MO). Isla El Rey, *Correa 113* (MO). Cerro Azul, *Croat 13007* (MO). Old Panama, *Cooper 339* (MO); *Greenman & Greenman 5142* (MO). Isla Espiritu Santo, *Duke 10437* (MO). Bejuco, *Duke 4581* (MO). Saboga Island, *Miller 1962* (MO, US); *Tyson & Loftin 5125* (MO). Chiva-Chiva Road, *Smith & Smith 3340* (MO). W of Chepo, *Tyson 5369* (MO).

15. CEPHAELIS

Cephaelis Swartz, Prodr. 3: 45. 1788. Nomen conserv. TYPE: *C. muscosa* (Jacq.) Swartz type cons.

Carapichea Aubl., Hist. Pl. Guiane 1: 167. 1775. Nomen rejic. TYPE: *C. guianensis* Aubl.
Tapogomea Aubl., Hist. Pl. Guiane 1: 367. 1775. Nomen rejic. TYPE: *T. violacea* Aubl.
Evea Aubl., Hist. Pl. Guiane 1: 103. 1775. Nomen rejic. TYPE: *E. guianensis* Aubl.
Ipecacuanha Arruda, Diss. Pl. Brazil 44. 1810. TYPE: *I. officinalis* Arruda.

Shrubs, trees, or occasionally woody herbs. *Leaves* often glabrous and with many lateral veins; stipules free or connate, frequently persistent. *Inflorescences* axillary or terminal, capitate, the head often branched, subtended by an involucre of bracts, the bracts often large, often highly colored, free or connate, becoming smaller and more concave adaxially. *Flowers* usually sessile; hypanthium short, the calycine cup short, truncate or dentate, often irregularly so, the teeth (4–)5(–7); corolla usually white, the indumentum variable, the tube funnelform or salverform, usually expanded basally, the lobes usually 5, valvate in bud; ovary 2-celled, the septum thick, a single ovule in each locule arising from the base of

the ovary. *Fruits* fleshy, the 2 pyrenes smooth or costate, the endocarp usually sulcate on the inner face.

Cephaelis occurs throughout the tropics of the New and Old Worlds. It has about 200 species. I have elected to separate *Cephaelis* from *Psychotria* although there are reasons for reducing the former to the synonomy of the latter, as J. Steyermark maintains. In Panama most of the species have capituliform inflorescences with large colored bracts which allow for easy allocation to *Cephaelis*. Standley & Williams in the Flora of Guatemala (1975) sum up the traditional stand: ". . . for practical purposes . . . it constitutes a most convenient segregate."

a. Inflorescences spiciform cylindrical, the rachis 5–12 cm long ..... 7. *C. dimorphandrioides*
aa. Inflorescences mostly rounded capitate, not spiciform cylindrical, the rachis or flowering capitulum less than 5 cm long.
  b. Inflorescence terminal.
    c. Heads of flowers subtended by 2 large flaring or mottled bracts obviously distinct in color and texture from the innermost bracts; outer bracts 2–5 cm long.
      d. Heads with the outermost bracts not mottled, uniformly red, occasionally orange or yellow, rarely white.
        e. Plants densely hairy; heads on erect peduncles ..... 20. *C. tomentosa*
        ee. Plants glabrate; heads on nodding or erect peduncles.
          f. Peduncles nodding; leaves to 29 cm long, papyraceous ..... 4. *C. correae*
          ff. Peduncles erect, the largest leaves to 15 cm long, coriaceous ..... 10. *C. elata*
      dd. Heads with outermost bracts obviously mottled, of various colors ..... 21. *C. vultusmimi*
    cc. Heads of flowers with outermost bracts more or less similar in texture and color to those within, less than 2 cm long.
      g. Heads of flowers disposed as a rotund capitate or subglobose mass.
        h. Subshrubs less than 1 m tall; mass of flowers 3–5 cm wide; petioles 4–7 cm long.
          i. Peduncle ca. 4 cm long ..... 17. *C. nana*
          ii. Peduncle 0.7–2.0 cm long ..... 8. *C. discolor*
        hh. Subshrubs ca. 2 m tall; mass of flowers to 2.5 cm wide; petioles 0.3–1.5 cm long ..... 12. *C. glomerulata*
      gg. Heads of flowers oblong or elliptical, not disposed as a rotund capitate or rotund mass.
        j. Heads ca. 0.5 cm long ..... 15. *C. kennedyi*
        jj. Heads more than 0.5 cm long.
          k. Leaves with 2 submarginal veins paralleling the margin; stem rhizophorous ..... 13. *C. insueta*
          kk. Leaves with 1 vein or no vein paralleling the margin; stem not rhizophorous.
            l. Leaves drying red or brown beneath, the lateral veins (20–)30–38.
              m. Petioles absent.
                n. Anthers to 2.2 mm long ..... 9. *C. dressleri*
                nn. Anthers 2.5–3.0 mm long ..... 19. *C. panchocoënsis*
              mm. Petioles of largest leaves ca. 4 cm long ..... 2. *C. bristanii*
            ll. Leaves not drying red or brown beneath (except *C. dressleri*), the lateral veins 12–25.
              o. Peduncle present.
                p. Peduncle terminated by 2 large bracts and 3 branches, each branch terminated by a capitulum of flowers; lateral veins ca. 12 ..... 6. *C. dichroa*

pp. Peduncle and general inflorescence not as above; lateral veins 13–25.
q. Leaves sessile or subsessile, auriculate at the base; stipules 2.0–2.8 cm long.
r. Bracts glanduliferous within, the glands diffuse or disposed in series; corolla 10–14 mm long ---------- 9. *C. dressleri*
rr. Bracts not glanduliferous within; corolla ca. 30 mm long ---------- 19. *C. panchocoënsis*
qq. Leaves with distinct petioles 0.3–1.5 cm long; stipules to 0.3 cm long.
s. Inflorescence with heads 1.5–3.0 cm wide; calycine teeth to 1.2 mm long, equal; corolla tube ca. 10 mm long ---------- 2. *C. glomerulata*
ss. Inflorescence with heads to 0.5 cm long; calycine teeth absent or disposed as mere points or obviously unequal, to 0.3 mm long; corolla tube to 3.2 mm long ---------- 15. *C. kennedyi*
oo. Peduncle absent ---------- 18. *C. panamensis*

bb. Inflorescence axillary.
t. Leaves with lateral veins 6–12.
u. Stipules membranous with conspicuous marginal subulate fimbriae; plants rhizomatous ---------- 14. *C. ipecacuanha*
uu. Stipules subcoriaceous or chartaceous without marginal fimbriae; plants not rhizomatous.
v. Leaves succulent, the lateral veins evanescent; stipules to 1 cm long; inflorescences with peduncle to 1 cm ---------- 11. *C. gaugeri*
vv. Leaves not succulent, the lateral veins conspicuous; stipules to 7 mm long; inflorescences with peduncle absent.
w. Leaves 1.6–5.0 cm wide; inflorescences 1.0–1.5 cm wide ---------- 1. *C. axillaris*
ww. Leaves 7–9 cm wide; inflorescences ca. 2 cm wide ---------- 16. *C. latistipulata*
tt. Leaves with lateral veins 15–38.
x. Stipules more than 1 cm long; inflorescences with heads 1.5–2.2 cm wide.
y. Leaves with lateral veins evanescent; blades succulent ---------- 3. *C. camponutans*
yy. Leaves with lateral veins obvious; blades not succulent -- 5. *C. croatii*
xx. Stipules less than 1 cm long; inflorescences with heads ca. 1 cm wide ---------- ---------- 2. *C. bristanii*

1. **Cephaelis axillaris** Swartz, Prodr. Veg. Ind. Occ. 45. 1788. TYPE: not seen. Not *Psychotria axillaris* Willd. 1798.

Tapogomea axillaris (Swartz) Poir., Encycl. Méth. Bot Suppl. 7: 585. 1806.
Evea axillaris (Swartz) Standley, Contr. U.S. Natl. Herb. 18: 123. 1916.
Psychotria aubletiana Steyermark. Mem. New York Bot. Gard. 23: 694. 1972. New name for *Cephaelis axillaris* Swartz.

Shrubs to 1½ m tall; branches few, usually arising near the middle of the stem, terete, smooth, glabrous, often attenuate toward the nodes, dilated at the node above the base of the stipule. *Leaves* usually salicoid, occasionally oblong to obovate oblong, occasionally falcate, 2–13 cm long, 1.6–5.0 cm wide, at least 2 times longer than wide, occasionally wider below the middle, the costa plane or grooved above, prominulous to prominent beneath, golden villosulose or glabrous, the lateral veins ca. 8, arcuate, prominulous, the intervenal areas spreading reticulate; petioles 1.5–2.0 cm long, slender, to 0.8 mm wide or stout and to 1.8

mm wide, glabrous or minutely pubescent; stipules briefly connate, oblong, to 7 mm long, to 5 mm wide at the base, retuse at the apex or split almost to the base, glabrous. *Inflorescences* axillary or terminal with short twiglets subtending, sessile, the flowers conglomerate in a rotund mass, 1.0–1.5 cm in diam.; bracts purplish, 4–6, ovate, shorter than the flowers, obtuse. *Flowers* with the hypanthium short, the calycine cup ca. 0.3 mm long, the teeth 5, unequal, obtuse, to 0.6 mm long, petaloid, glabrous except marginally, with a few oblong glands on the inside of the cup, to 0.2 mm long; corolla white, the tube cylindrical, somewhat inflated, ca. 5 mm long, to 1.8 mm wide, petaloid, glabrous outside, villose within on the upper ⅔, the lobes 5, oblong, glabrous; stamens 5, the anthers oblong, ca. 2.2 mm long, 0.5 mm wide, obtuse, the filaments ca. 0.15 mm wide; style ca. 2.2 mm long, shorter than the tube, the stigmas upright, ca. 0.3 mm long. *Fruits* sessile, oblong rotund, 3.5–4.5 mm in diam., each pyrene compressed hemispherical in cross section, smooth, glabrate, usually with minute white raphides, the grooves about 4.

Cephaelis axillaris is widespread in the tropics, extending from Mexico, through Central America, to Colombia and Venezuela. It also occurs in the West Indies.

Steyermark (1972), who has incorporated *Cephaelis* into *Psychotria*, annotated many specimens of "*Cephaelis axillaris* Sw." as *Psychotria aubletiana* Steyermark. In the synonomy under *P. aubletiana* he (1974) listed: "*Cephaelis axillaris* Sw., Prodr. Veg. Ind. Occ. 45: 1788, no *Psychotria axillaris* Willd., Sp. Pl. 1: 962. 1798, basada sobre *Ronabea erecta* Aubl., ni *Psychotria axillaris* Vell., Fl. Flum. 67: 2. *pl. 32*. 1827." He recognized 7 varieties, 5 of which occur in Venezuela.

CHIRIQUÍ: New Switzerland, valley of Río Chiriquí Viéjo, *Allen 1391* (F, MO). Cerro Horqueta, *Blum & Dwyer 2654* (MO). Las Nubes, 5.5 km NW of Río Chiriquí Viéjo, *Busey 674* (MO). Las Cumbres, near Cerro Punta, *Croat 13712* (MO). Above Río San Félix, 13 mi N of Río San Félix, 800–1200 m, *Croat 33424* (MO). Cerro Punta, *Davidson 211* (F). Cerro Horqueta, *Dwyer et al. 547* (DUKE, F, GH, K, MO, NY, PA, UC, US). Road to Bajo Grande, Cerro Punta, *Folsom 4013* (MO). Cerro Colorado, 1500 m, *Folsom & Collins 1767* (MO). Between Quebrada Hondo and divide on Caldera Chiriquicito Trail, *Kirkbride & Duke 921* (MO). Divide, Chiriquicito Trail, *Kirkbride & Duke 963* (MO). Cerro Pando, 16 km NW of El Hato del Volcán, 2000–2482 m, *Mori & Bolten 7266* (MO). Cerro Hornitos, 40 km NW of Gualaca, *Mori & Bolten 7474* (MO). N of San Félix at Chiriquí-Bocas del Toro border, Cerro Colorado Copper Mine Road, 5000–5500 ft, *Mori & Kallunki 5792* (MO). Cerro de Garagara, *Pittier 5643* (US). 6 mi above Cerro Punta, Boqueté Trail, ca. 7000 ft, *Tyson 7071* (MO). Cerro Punta, *White 28* (F, MO). Upper Chiriquí Viejo, *White & White 25* (F, MO). Cerro Horqueta, *Wilbur et al. 13464* (MO). Bajo Chorro, *Woodson & Schery 699* (F, MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 853* (F, MO). DARIÉN: Serrania de Pirre, 9–10 km N of Alto de Nique, 1520–1560 m, *Croat 37856* (MO). Cerro Mali base camp, lower montane wet forest, 1400 m, *Gentry & Mori 13824* (MO).

2. **Cephaelis bristanii** Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 34. 1968. TYPE: Panama, *Bristan 575* (MO).

Subshrubs to 30 cm tall, the stems smooth, glabrous, black, scarcely nodose, often prostrate and bearing long narrow roots. *Leaves* oblong, 9–16 cm long, 3.5–6.0 cm wide, apically deltoid, ultimately obtuse, attenuate cuneate at base, the costa slender, prominulous or plano-convex beneath, the lateral veins 15–30, 0.5–0.8 cm apart, arcuate, the intermediate veins evanescent, rigidly papyraceous, concolorous, glabrous; petioles to 4 cm long, to 1.5 mm wide; stipules connate,

the sheath compressed annular, 1–2 mm long, minutely and obtusely 2-apiculate. *Inflorescences* axillary, the peduncles solitary, to 2 cm long, black, smooth, the flowers aggregated into 1–2 rotund capitula, ca. 1 cm in diam., the bracts many, clustered, the interior bracts becoming narrower adaxially, oblong, acute, puberulent. *Flowers* with the hypanthium funnel shaped, scarcely 2 mm long, the calycine cup petaloid in texture, ca. 1 mm long, the lobes 4(?), short, truncate or obtuse, often much reduced, the margin then erosulose, often with a few straight cilia; corolla with the tube narrow cylindrical, to 7 mm long, ca. 1 mm wide in the middle, petaloid, glabrous outside, densely white pilose within above the middle of the tube, the lobes 4, to 2 mm long, obtuse; stamens 5, the anthers ca. 0.8 mm long, the filaments linear, ca. 3 mm long; stigmas 2, erect, ca. 1 mm long. *Fruits* red (fide Bristan), not seen.

Cephaelis bristanii is known from Costa Rica and Panama. "Hinupichica" (Cuna, fide *Duke 1243*).

BOCAS DEL TORO: Quebrada Lugron and Cerro Bonyik near Río Teribe, *Kirkbride & Duke 641* (MO). DARIÉN: Cerro Pirre, *Bristan 575* (MO). Caná Cuasí Trail, Cerro Campanimento near Tres Bocas, Río Cuasí headwaters, *Kirkbride & Duke 1243* (MO).

3. **Cephaelis camponutans** Dwyer & Hayden, Ann. Missouri Bot. Garden 55: 35. 1968. TYPE Panamá, *Dwyer & Gauger 7346* (MO, holotype).

Subshrubs to 0.7 m tall, the branchlets smooth, glabrous, the nodes somewhat prominent; roots slender. *Leaves* strongly ascending, to 18 cm long, to 5 cm wide, attenuate acuminate at the apex, the acumen to 3 cm long, acute at the base, scarcely inequilateral, the costa scarcely prominulous to plane beneath, ca. 2 mm wide proximally, the lateral veins 15–20, evanescent when dry, strongly ascending, the margin somewhat thickened, subcoriaceous, smooth, glabrous; petioles slender, to 3 cm long; stipules obovate rotund, to 1.5 cm long, ca. 1 cm wide, obtuse or somewhat bifid(?) at the apex, thin, with minute raphides, the margins erosulose. *Inflorescences* axillary, 1–3 per axil, the peduncles to 1 cm long, often nodding, the flowers conglomerate in compressed-rotund heads to 2 cm wide, blackening on drying, the exterior bracts solitary, subovate, to 1.5 cm long, coriaceous, with a median keel, the internal bracts smaller and narrower, a pair of bracteoles enclosing each flower. *Flowers* with the calyx tubular, the lobes 5–6, erect, subulate, longer than the tube, the margin scarious; corolla purple or white; stigmas 2, erect, digitiform, ca. 1 mm long. *Fruits* (immature) crowned by a persistent calyx, the pyrenes 2, elliptic; seeds with the adaxial surface plane, the endosperm smooth, the testa somewhat pigmented, perhaps bilamellate, the parenchyma cells somewhat isodiametric, 23–55 mμ in diam.

Cephaelis camponutans Dwyer & Hayden is known only from Panama.

BOCAS DEL TORO: Punta Peña near Chiriquicito, *Lewis et al. 2171* (GH, MO). COLÓN: Santa Rita Ridge, *Croat 15345* (MO); *Dwyer & Lallathin 9042, 9043* (both MO); *Mori & Kallunki 2090* (MO). PANAMÁ: 1 mi past La Eneida, Cerro Jefe, *Correa & Dressler 970* (MO). Goofy Lake to Cerro Jefe, *Croat 15204* (MO). El Llano-Cartí Road, 10 mi from Interamerican Highway, *Croat 33766* (MO). Cerro Jefe, ca. 600 m, *Croat 35871* (MO). El Llano-Cartí Road, 12 km from Panamerican Highway, *D'Arcy 10609* (MO). Cerro Jefe, *Dwyer & Gauger 7346* (MO); *Gentry 2882, 3523* (both MO). El Llano-Cartí Road, *Folsom 2589* (MO); *Liesner 677, 1190* (both MO); *Mori et al. 4630* (MO). VERAGUAS: 5 mi NW of Santa Fé, *Liesner 974* (MO).

4. **Cephaelis correae** Dwyer & Hayden, Ann. Missouri Bot. Garden 55: 36. 1968. TYPE: Panamá, *Lewis et al. 1759* (MO, holotype).

Small *trees*, to 5 m tall, the branchlets terete, smooth. *Leaves* oblong, to 29 cm long, to 12 cm wide, obtuse to deltoid at the apex, cuneate at the base, the costa somewhat prominulous above, ca. 2.5 mm wide, prominulous beneath, the lateral veins ca. 20, 1.0–1.5 cm apart, at first strict, becoming arcuate near the margin, the intermediate veins pinnatiform, membranaceous, smooth, glabrous; petioles 0.5–0.8 cm long, slender, ca. 0.25 cm wide, smooth, glabrate; stipules briefly connate, the sheath short, 2–5 mm long, interpetiolar, truncate, the lobes large, subrotund, longer than the sheath, obtuse, somewhat spreading, the margin scarious. *Inflorescences* terminal, solitary, glabrous, the peduncle to 20 cm long, at maturity nodding, ca. 0.3 cm wide in the middle, the exterior bracts 2, to 5 cm long, to 5.5 cm wide, conspicuously glistening, red or somewhat purple, venose, the interior bracts to 1.5 cm long, red to purplish, the larger exterior bracts compressed obovate rotund, much wider than long, undulate marginate, often with several shallow lobes, the smaller bracts obovate rotund and clawed, the claw short or to about the same length as the blade, glabrous, petaloid. *Flowers* ca. 1.5 cm long, the hypanthium and the calyx 2–3 cm long, glabrous, the cup eglandular, the calycine teeth 5, triangular, unequal, 1–1.2 mm long, each tooth often erosulose; corolla white, the tube cylindrical, to 10 mm long, inflated above, stiffly petaloid, glabrous outside, puberulent within near the filament attachment, the lobes 5, triangular oblong, ca. 3 mm long, glabrous; stamens 5, the anthers linear, ca. 3 mm long, the filaments attached near the middle of the tube; style linear, to 12 mm long, the stigmas 2, oblong, ca. 1.2 mm long. *Fruits* glistening blue, obovate oblong, 1.5 cm long, the calycine cup persistent; seeds subtriangular, flat on the ventral face, somewhat sulcate in the middle.

Cephaelis correae is found only in Panama.

COCLÉ: El Valle, *Allen 1648* (MO). Cerro Pilón and La Mesa, *Correa 52* (MO); *Croat 14335* (MO); *Duke 12347* (MO); *Duke & Lallathin 15010* (MO); *Dwyer 10534* (MO); *Dwyer & Correa 7961* (MO); *Dwyer & Lallathin 8690 A* (MO); *Gentry 5695* (MO); *Lewis et al. 1759* (GH, MO, UC, US); *Luteyn & Kennedy 1707* (MO); *Porter et al. 4636* (COL, MO, SCZ, UC, VEN); *Wilbur & Luteyn 11722* (MO). La Pintada, *Hunter & Allen 541* (MO).

5. **Cephaelis croatii** Dwyer.[11] TYPE: Panamá, *Croat 27204* (MO, holotype; NY, isotype).

Shrubs 1.0–1.3 m tall, the branchlets glabrous, smooth, ultimately angular, the pith porate. *Leaves* elliptic oblong, 14.5–29.0 cm long, 5.5–9.0 cm wide, rounded or obtuse and abruptly acuminate at the apex, basally cuneate or atten-

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[11] *Cephaelis croatii* Dwyer, spec. nov. *Frutices* ad 1.3 m alti, ramulis glabris. *Folia* elliptico-oblonga, 14.5–29.0 cm longa, 5.5–9.0 cm lata, basin versus cuneata, venis lateralibus ca. 30, lato-arcuatis, rigido-papyracea minuto-puberula; petiolis 3–5 cm longis; stipulis basi connatis ovato-oblonga vel oblongo-rotunda, ad 1.5 cm longa, versus apicem angusta tunc in lobos 2 subulatos vel angusto-oblongos fissa. *Inflorescentiae* axillares, 4–6 cm longae, 3.0–5.5 cm latae, capitibus florum 6–8 oblongis vel rotundis, ad 1.5 cm latis, bracteis exterioribus ad 0.8 cm longis. *Flores* cupula calycis cylindrica, 0.5 mm longa, lobis 5, 0.6–1.0 mm longis; corolla alba tubo cylindrico, 6.5 mm longo, extus glabro intus villoso lobis 5 lanceolatis, ca. 2.5 mm longis; antheris 1 mm longis. *Fructus* non visi.

uate acute, somewhat inequilateral, the costa prominulous above, prominent beneath, the lateral veins ca. 30, widely arcuate with an irregular vein between a pair of lateral veins, rigidly papyraceous, slightly discolorous, minutely puberulent; petioles 3–5 cm long, often twisted, to 0.25 cm wide, glabrate; stipules connate, often turgid, ovate oblong or oblong-rotund, to 1.5 cm long, narrow toward the apex, then each part splitting into 2 subulate or narrowly oblong ascending lobes, these to 0.7 cm long, subcoriaceous, glabrous. *Inflorescences* axillary, 5–6 cm long, 3.0–5.5 cm wide, drying black, the peduncle to 3 cm long, to 0.3 cm wide, twisted, plano compressed, the flowers aggregated into heads, these 6–8, oblong or rotund, to 1.5 cm wide, sessile or on branchlets, variable in length, to 2 cm long, puberulent; bracts rotund, outermost 8–10 mm long, 8 mm wide, concave, carnose, minutely pubescent outside, minutely ciliolate within, purple. *Flowers* with the hypanthium short, the calycine cup cylindrical, ca. 0.5 mm long, turgid, petaloid, with a gland at the base of adjacent lobes, the lobes 5, triangular subulate or narrowly oblong, 0.6–1.0 mm long, obtuse, glabrous within, ciliate; corolla white, the tube cylindrical, ca. 6.5 mm long, somewhat dilated below the middle, glabrous outside, villose within, the lobes 5, lanceolate, ca. 2.3 mm long, somewhat cucullate; stamens 5, the anthers oblong, 1 mm long, obtuse, the filaments short; style slender, somewhat expanded toward the apex, the stigmas 2, short, rotund, wider than the style. *Fruits* not seen.

Cephaelis croatii is known only from Panama. It is named in honor of Thomas B. Croat, distinguished student of the flora of Panama. There are several distinguishing characters: relatively broad leaves with numerous lateral veins; large bilobed stipules; and subrotund, capitate clusters of flowers, about 5 per head.

DARIÉN: Upper gold mining camp of Tyler Kittredge, headwaters of Río Tuquesa ca. 2 air km from continental divide, *Croat 27204* (MO).

6. **Cephaelis dichroa** (Standley) Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 296. 1929.

Evea dichroa Standley, Contr. U.S. Natl. Herb. 18: 124. 1916. TYPE: Panamá, *Pittier 3218* (US, holotype).

Glabrous *shrubs*, to 2 m tall. *Leaves* elliptic, 8.5–13.0 cm long, to ca. 3.2 cm wide, acuminate at the apex, cuneate at the base, the lateral veins ca. 12, stiffly papyraceous, concolorous, often drying yellowish, glabrous; petioles to 3 cm long, wiry, often flexuous; stipules connate, ca. 3.5 mm long, the body compressed cylindrical, each part with 2 widely spaced, erect, obtuse lobes about as long as the sheath. *Inflorescences* terminal, the peduncle 5–8(–9) cm long, terminated by 3 heads of flowers, the trio subtended by 2 large obovate bracts, to 2.2 cm long, ca. 1.8 cm wide. *Fruits* subrotund to 0.8 cm wide.

Cephaelis dichroa is known only from Panama. Standley's original description of the inflorescences and flowers may help in the understanding of this species: "Peduncles terminal or rarely also axillary, 3–9 cm long; bracts 15–20 mm long, rounded ovate, acutish, slightly united at the base, green or tinged with red or yellow, subtending 3 pedunculate heads, the peduncles 3–25 mm long; each secondary head subtended by 2 orbicular-rhombic bracts 12–15 mm long, these yel-

low or tinged with purple, each head consisting of 3 flowers, each flower subtended by an oblong obovate acute bract 10–12 mm long and an oblong-linear bracteole somewhat shorter; flowers sessile; calyx 3 mm long, twice as long as the ovary, somewhat oblique, yellow, deeply 5-lobed, the lobes ovate, oblong, acute; corolla yellowish white, the tube 10 mm long and 2 mm in diameter, the 5 lobes 2.5–3 mm long, oblong, obtuse; stamens included, inserted in the middle of the tube, the filaments about as long as the anthers, these linear, 2.5 mm long; fruits not seen."

Another collection, *Mori & Kallunki 2732* (MO), from between Fort San Lorenzo and Fort Sherman near Pavon Road junction with Road 82 (S 2), Canal Zone, may be *C. dichroa*. It is 2½ m tall with bracts magenta and fruits black, but its sea level locality argues against such determination.

CHIRIQUÍ: Cerro Horqueta, *Hagen & Hagen 2089* (F, US). Cerro Colorado, 50 km N of San Felix on the continental divide, 1200–1500 m, *Mori & Dressler 7843* (MO). Cuesta de Las Palmas, S slope of Cerro Horqueta, 1700–2100 m, *Pittier 3218* (F, NY). Cerro Horqueta, *Pittier 3266* (US).

7. **Cephaelis dimorphandrioides** Dwyer.[12] TYPE: Panamá, *Croat 27470* (MO, holotype).

Shrubs to 1.4 m tall. *Leaves* elliptic oblong, often falcate oblong, 17–30 cm long, 6–14 cm wide, deltoid or obtuse toward the apex, acute or abruptly acute toward the base, the costa slender above, prominent beneath, the lateral veins 13–17, arcuate, often with one smaller and shorter vein between 2 lateral veins, the intervenal areas spreading reticulate, rigidly chartaceous, discolorous, glabrate above, minutely puberulent beneath; petioles lignose, to 4.5 cm long, twisted, puberulent; stipules (only one pair seen at tip of twig) oblong rotund, to 0.7 mm long, deeply 2-lobed, coriaceous, the lobes rounded, farinose, glabrous within. *Inflorescences* terminal, sessile, cylindrical, 5–12 cm long, to 4 cm wide, obtuse at the apex, black when dry, the flowers more than 100. *Flowers* perhaps sessile, the hypanthium short, swollen, puberulent, the calycine cup short, ca. 5 mm long, the teeth subulate, to 6.5 mm long, unequal, acute, puberulent outside, glabrous inside, carnose, with 3 longitudinal veins, with 2–4 oblong glands, to 0.3 mm long, at the sinuses; corolla red outside, the tube narrowly cylindrical, 10–14 mm long, puberulent outside, glabrous within, subcarnose, the lobes 5, yellow within, lance oblong, to 3 mm long, carnose, puberulent outside; stamens 5, the anthers narrow oblong, 2.8–3.0 mm long, minutely apiculate, slender, attached below the middle of the tube; ovarian disc 4-lobed, to 0.8 mm long, the style linear, 9–14 mm long, the stigmas 2, reflexed, linear oblong, to 0.8 mm long.

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[12] *Cephaelis dimorphandrioides* Dwyer, spec. nov. *Frutices* ad 1.4 m alti. *Folia* elliptico-oblonga, saepe falcato-oblonga, 17–30 cm longa, 6–14 cm lata, venis lateralibus 13–17 rigido-chartacea supra glabrescentia infra minuto-puberula; petiolis ad 4.5 cm longis; stipulis oblongo-rotundis, ad 0.7 mm longis, bilobatis glabris. *Inflorescentiae* terminales sessiles cylindricae et spicae similes, 5–12 cm longae, ad 4 cm latae, floribus numerosis fortasse 100. *Flores* cupula calycis ca. 5 mm longa, dentibus subulatis ad 6.5 mm longis; corolla extus rubra, tubo angusto-cylindrico, 10–14 mm longo, extus puberulo intus glabro lobis 5, ca. 3 mm longis; antheris ca. 3 mm longis. *Fructus* oblongi, ad 0.5 cm longi.

Fruits (immature) oblong, to 5 mm long, to 0.3 mm wide, truncate, each pyrene smooth, black, 10-ribbed, the hairs weak, white, arachnoid.

Cephaelis dimorphandrioides is known only from Veraguas. It is distinguished from all other *Cephaelis* by the cylindrical spikelike inflorescence which bears a resemblance to the inflorescence of the legume genus *Dimorphandra*.

VERAGUAS: Valley of Río Dos Bocas between Alto Piedra and Calovébora, 350–400 m, *Croat 27470* (MO, holotype). Road from Santa Fé to Calovébora (Panamanian Highway 35) 16 km from Santa Fé; on Atlantic slope near Río Caloveborita, *Mori et al. 6675* (MO).

8. **Cephaelis discolor** Polak., Linnaea 41: 572. 1877. TYPE: Costa Rica, *Polakowsky 384* (F, MO, US, photos).

Cephaelis tonduzii Krause, Bot. Jahrb. Syst. 54. Beibl. 119: 45. 1916. TYPE: Costa Rica, *Tonduz 11461* (F).
Evea guapilensis Standley, J. Wash. Acad. Sci. 15: 104. 1925. TYPE: Costa Rica, *Standley 37025* (US, holotype).
Cephaelis nicaraguensis Standley, Trop. Woods 16: 46. 1928. TYPE: Nicaragua, *Englesing 58* (F).
C. guapilensis (Standley) Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 295. 1929.

Subshrubs to 1 m tall, usually unbranched, the stem terete, smooth, glabrous. *Leaves* oblong, to 22 cm long, to 8.5 cm wide, subobtuse to deltoid at the apex, acuminate, the acumen to 1.5 cm long, basally cuneate or attenuate acute, slightly inequilateral, the costa prominulous above, prominent beneath, the lateral veins 12–14, arcuate, each pair with usually 1 subparallel irregular vein, soon evanescent, the intervenal areas spreading reticulate, delicately marginate, stiffly chartaceous, usually discolorous, glabrous; petioles to 7 cm long, slender, 0.13–0.20 cm wide, ascending, glabrous; stipules connate for 0.4–4.0 mm, each with 2 slender awns, to 8 mm long, these often reflexed, often deciduous, glabrous. *Inflorescences* terminal, the peduncles 0.7–2.0 cm long, lignose, glabrate, the flowers aggregated into a subrotund mass, 3–5 cm in diam.; bracts purple green or purple, obovate lanceolate, 0.8–1.0 cm long, petaloid, glabrous, venose. *Flowers* with the hypanthium subrotund or oblong, ca. 1.5 mm long, constricted below the calycine cup, the cup short, the lobes 4–5, subequal or equal, triangular, 0.8–1.5 mm long, 2–3 times the length of the cup; corolla and sex organs not seen; ovarian disc bilobed, ca. 0.5 mm long. *Fruits* bright blue, ca. 1 cm in diam., the fleshy exterior often persisting, the pyrenes when united rotund, buttockslike, the central groove conspicuous, ca. 5 mm in diam., glabrate, smooth, the raphides minute, numerous, the calycine cup persistent, 0.5–0.8 mm in diam.

Cephaelis discolor occurs in Costa Rica, Panama and Colombia.

BOCAS DEL TORO: Water Valley, *Wedel 1508* (MO). CANAL ZONE: Barro Colorado Island, *Croat 11870* (MO). Pipeline Road, *Gentry & Dressler 1978* (MO). COLÓN: Santa Rita Ridge Road, 8.5 km from Boyd-Thatcher Highway, *Mori & Kallunki 2089* (MO). DARIÉN: La Boca de Pirre, *Bristan 1273* (MO). Cerro Pirre, *Duke 5307* (MO); *Duke & Elias 13767* (MO). Cocolito, *Dwyer 5136* (MO). PANAMÁ: Cerro Campana, *Allen 1886* (MO). Cerro Trinidad, *Allen 3774* (MO). Cerro Campana, *Croat 14752* (MO). Cerro Jefe, *Foster & Kennedy 1818* (F). Cerro Campana, *Gentry 5783* (MO); *Kirkbride & Hayden 239* (MO); *Lewis et al. 3061* (MO). VERAGUAS: N of Santa Fé, N of Escuela Agricola Altos de Piedras, *Mori & Kallunki 2533, 2587, 2619* (all MO). COLOMBIA: CHOCO: Serrania del Darién, W of Unguia on Panama border, 1150 m, *Gentry et al. 17038* (MO).

9. **Cephaelis dressleri** Dwyer.[13] TYPE: Panamá, *Croat 16801* (MO, holotype).—FIG. 15.

Subshrubs to 1.5 m tall, the stem lignose, rough, glabrous, the pith partly porous, sometimes rooting toward the apex. *Leaves* occasionally sessile, obovate oblong, 10–44 cm long, 6.5–22.0 cm wide, rounded or widely deltoid at the apex, short acuminate, the acumen triangular, to 1 cm long, to 1.5 cm wide at the base, cuneate toward the base finally slightly auriculate, the costa prominulous above or prominent, to 0.2 cm wide, prominent beneath, to 0.35 cm wide, dark brown and densely minutely puberulent, the lateral veins 21–25, slightly arcuate, forming an undulate marginal vein to 1 cm from the margin, the venules irregular pinnatiform and spreading, rigidly papyraceous to subcoriaceous, 1 of the 2 leaves drying slightly dark purple red beneath, minutely ferrugineous puberulent on the veins and venules; petioles, if present, to 4 cm long, stout; stipules (only 1 seen at the tip of the stem) ovate lanceolate, to 2.8 cm long, to 1 cm wide, subcoriaceous, glabrous, the veins somewhat prominulous, fanshaped, the awns narrowly ovate subulate, to 0.9 cm long, acute. *Inflorescences* terminal, 4.5–8.0 cm long, the peduncles 1–4 cm long, 0.3–0.5 cm wide, glabrous, bearing several short branches, the flowers disposed in a few subsessile oblong or subrotund heads, ca. 2 cm in diam., the cluster of heads compressed rotund, 3.5–5.5 cm wide; outermost bracts rotund or spathulate, to 12 mm long, brown, ultimately acute, concave, within with an irregular series of glands on each side of a median vein or with a few diffuse glands, ciliate; interior bracts several, narrower and more spathulate. *Flowers* subsessile; hypanthium scarcely measurable, the calycine cup to 2 mm long, petaloid, with ca. 10 unequal, narrowly oblong or widely subulate glands attached toward the base of the cup, the calycine lobes 5, subulate or triangular, to 3 mm long, slightly unequal, acute, densely ciliate; corolla white, the tube narrow cylindrical, 10–14 mm long, petaloid, glabrous or minutely puberulent outside, glabrous inside except white villose near or above the middle, the lobes 5, narrowly lanceolate, to 4.5 mm long, 1 mm wide, conspicuously cucullate near the middle, ultimately obtuse, carnose; stamens 5, the anthers narrowly ovate oblong or oblong, 2.5–3.0 mm long, sagittate at the base, the filaments slender, ca. 2.5 mm long, attached ca. 2 mm below the mouth; ovarian disc oblong rotund, ca. 1 mm long, the style slender, 6.5–9.0 mm long, the stigmas slender, ca. 2 mm long, densely villosulose. *Fruits* sessile, elliptic oblong, to 1.2 cm long, 0.4 cm wide, smooth, glabrous, each pyrene 4-sulcate, the ribs obtuse angular, the often persistent calycine cup and teeth to 3.5 mm long.

Cephaelis dressleri is known from Panama and Colombia. It is named in honor of Dr. Robert Dressler, student of the flora of Panama and a specialist in the

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[13] *Cephaelis dressleri* Dwyer, spec. nov. *Suffrutices* ad 1.5 m alti, caule lignoso aspero glabro interdum apice rhizophoro. *Folia* sessilia vel subsessilia obovato-oblonga, 10–44 cm longa, 6.5–22.0 cm lata, rotunda apice vel vix latodeltoidea, versus basim cuneata ultime vix auriculata venis lateralibus ad 25, rigido-papyracea vel subcoriacea puberula; stipulis ovato-lanceolatis, ad 2.8 cm longis, ad 1 cm latis, setis solitariis ad 0.9 cm longis, acutis. *Inflorescentiae* terminales, 4.5–8.0 cm longae, pedunculo 1–4 cm longo, caespite florum compressorotundo, 3.5–5.5 cm lato; bracteis exterioribus rotundis vel spathulatis, ad 12 mm longis. *Flores* cupula calycis dentibus ad 3 mm longis; corolla tubo 10–14 mm longo, extus glabro, lobis ad 4.5 mm longis; antheris 2.5–3.0 mm longis. *Fructus* elliptico-oblongi, ad 1.2 cm longi, glabri.

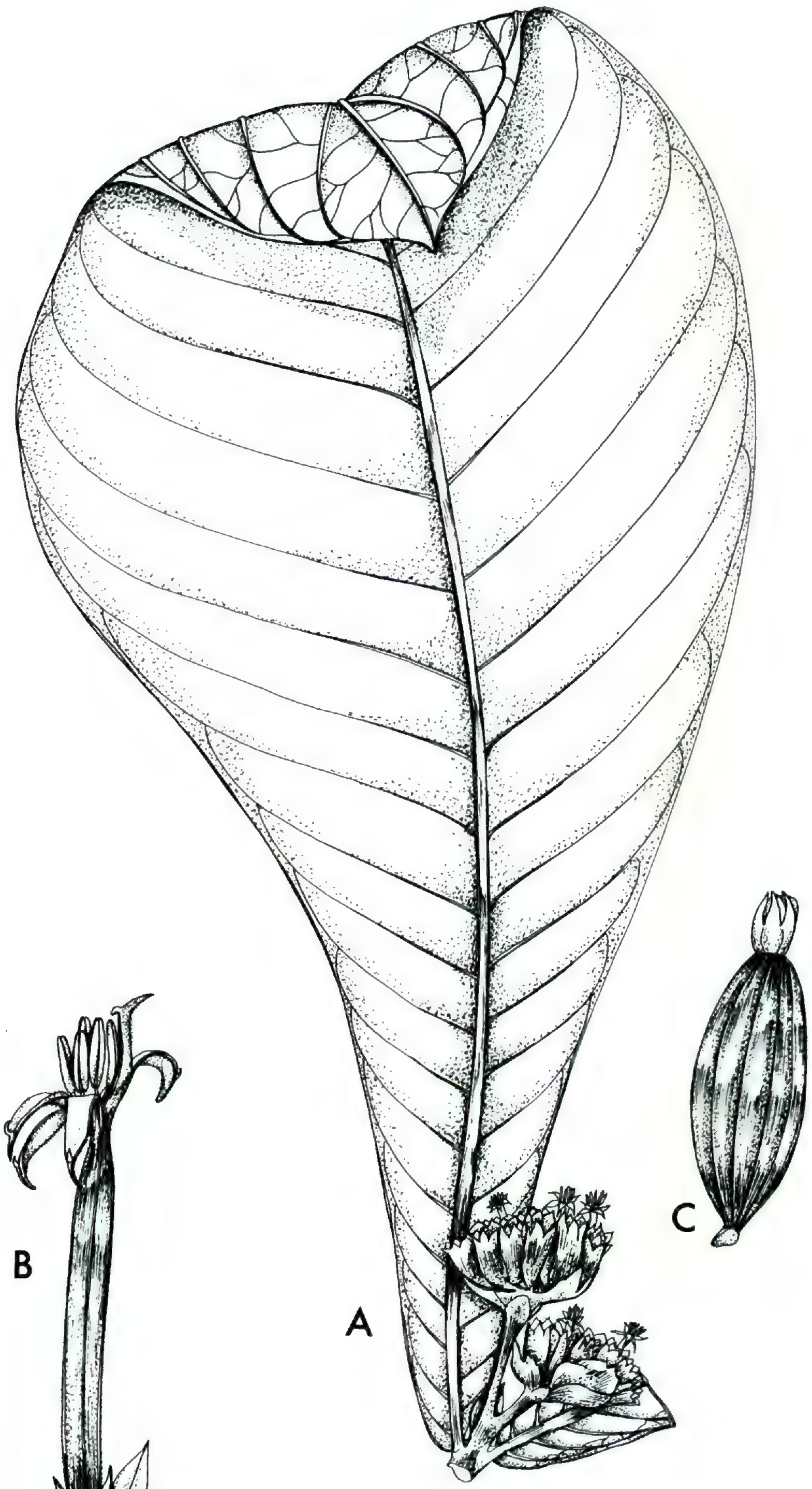

FIGURE 15. *Cephaelis dressleri* Dwyer.—A. Leaf and inflorescence (×½).—B. Flower (×3).—C. Fruit (×3). [After *Dressler 4677*.]

Orchidaceae. It is distinguished by its large sessile or subsessile leaves, round at the apex, with many lateral veins, and subauriculate at the base. The glands within the larger bracts and within the calycine cup are diagnostic.

COLÓN: Near Agua Clara at rain gauge, Santa Rita lumber road, *Dressler 4677* (MO). DARIÉN: Trail from Tacarcuna village, Río Tacarcuna to Cerro Mali, 800–1300 m, *Gentry 13598* (MO). SAN BLAS: Puerto Obaldía, *Croat 16801* (MO). COLOMBIA: CHOCO: Río Tigre W of Unguia, base of Serrania del Darién, 300 m, *A. Gentry & L. Aguirre 15191* (MO).

10. **Cephaelis elata** Swartz, Prodr. 45. 1788. TYPE: Jamaica, *Swartz*, not seen.

Cephaelis punicea Vahl, Eclog. Amer. 1: 19. 1796. TYPE: Jamaica, *von Rohr*, not seen.
Tapogomea elata Aubl. ex Lam., Encycl. Méth. 7: 585. 1806. TYPE: not seen.
Cephaelis costaricensis Schlecht., Linnaea 28: 546. 1856. TYPE: not seen.
Uragoga punicea (Vahl) Schum. in Engl. & Prantl, Nat. Pflanzenfam. IV: 120. 1891.
Evea elata (Sw.) Standley, Contr. U.S. Natl. Herb. 18: 123. 1916.
Cephaelis chiriquiensis Standley, Ann. Missouri Bot. Gard. 28: 469. 1941. TYPE: Panamá, *Woodson & Schery 610* (MO, holotype).

Shrubs or trees to 8 m tall, the branches few to many, smooth, terete or angular, glabrate, occasionally constricted below the nodes, the nodes often swollen (persistent stipules). *Leaves* narrowly oblong or obovate oblong, 10–25 cm long, 1.5–7.0 cm wide, obtuse, widely deltoid or rounded at the apex, acuminate, the acumen short, acute, basally cuneate to obtuse, the costa prominent, prominulous to subplane above, prominent beneath, the lateral veins (12–)16–22, widely arcuate or at first widely divergent and then arcuate marginally, the margin often slightly revolute, stiffly papyraceous to subcoriaceous, not herbaceous (Panama), lustrous and glabrous above, glabrous or pubescent on the costa and the veins beneath; stipules persistent, connate, turgid, cupshaped, to 1.2 cm long, each part of the sheath bilobed, the lobes usually hemispherical, as long as or longer than the sheath, obtuse, coriaceous, glabrous, the margins scarious, often widely so. *Inflorescences* terminal, the peduncle solitary or rarely 2–4 at the tip of the twiglet, 0.5–3.5 cm long; heads including 2 outermost bracts to 6.5 cm wide; outermost bracts ovate rotund, to 7 mm long, deep red or rusty orange.

CANAL ZONE: Camp Piña, *Duke 4400* (MO). Pena Road, *Tyson & Chu 1700* (MO). Fort Sherman, *Tyson & Dwyer 1215* (MO). CHIRIQUÍ: Bajo Chorro, Boqueté District, *Davidson 103* (MO). Cerro Horqueta, *Kirkbride 131, 132* (both MO). Between Pinola and divide on Chiriquicito-Caldera Trail, *Kirkbride & Duke 845* (MO). Bajo Chorro, *Woodson & Schery 610* (MO). COCLÉ: Cerro Pajita, N of El Valle de Antón, *Allen & Allen 4168* (MO). Cerro Caracoral, *Duke & Dwyer 15103* (MO). El Valle, *Dwyer & Correa 7998* (GH, MO, US); *Lewis et al. 1713* (GH, MO, US). COLÓN: Santa Rita Ridge, *Croat 14146* (MO). DARIÉN: Cerro Pirre, *Bristan 462* (MO); *Duke 6570* (MO). Summit camp between Sasardí and Mortí, *Duke 10034* (MO). Cerro Pirre, *Duke & Elias 13752* (GH, MO). Top of Cerro Malí, old helipad, *Gentry & Mori 1366* (MO). Summit camp, Darién-San Blas border, *Oliver et al. 3692* (COL, MO, UC, VEN). Caná-Cuasí Trail, *Terry & Terry 1480* (MO). PANAMÁ: Cerro Jefe, *Blum & Duke 2197* (MO). Cerro Campana, *Blum et al. 2371* (MO). El Llano-Cartí Road, 330 m, *Croat 33742* (MO). Cerro Jefe, *Duke 8018* (MO); *Dwyer 444* (MO). Cerro Azul, *Dwyer 1369* (MO). Cerro Jefe, *Elias & Hayden 1797* (MO); *Folsom 2012* (MO). El Llano-Cartí road, 6 km N of Panamerican Highway, *Folsom 2551* (MO). El Llano-Cartí road, 13.7 km N of Panamerican Highway, *Folsom 2579, 3505* (both MO). Top of Cerro Jefe, *Folsom 3614* (MO). Cerro Campana, *Hayden 118* (MO). Cerro Jefe, *Kirkbride & Crebbs 33* (MO). Altos del Río Pacora, *Lewis et al. 2262* (COL, DUKE, K, MO), *2356* (COL, MO, UC, VEN). Cerro Jefe, *Tyson 3189, 3205, 3231, 3254, 3285, 3288, 3373, 3389, 3425, 3546, 3577, 3588* (all MO); *Witherspoon et al. 8282, 8503* (both MO). SAN BLAS: SE of Puerto Obaldía, *Croat 16750* (MO). E of Cangandí-Mandinga airport road, 2–5 mi S of Mandinga airport, *Duke 14771* (MO). Between Río Diabolo and Río Acuatí near Nargana, *Duke 14865* (MO). VERAGUAS: 3.9–5.0 mi N of Santa Fé, *Gentry 2951* (MO). Mouth of Río Concepción, *Lewis et al. 2806* (COL,

DUKE, MO, UC, VEN). Cerro Hornitos, 2238 m, *Mori & Bolten 7496* (MO). 10 km NW of Santa Fé, road to Calovébora, *Mori & Bolten 7639* (MO). N of Santa Fé, Escuela Agricola Alto de Piedra, *Mori & Kallunki 2507* (MO).

11. **Cephalis gaugeri** Dwyer.[14] TYPE: Panamá, *Mori et al. 3779* (MO, holotype).

Subshrubs to ⅓ m tall, the stem rhizomatous at the base, the roots fibrous, the stem unbranched, ca. 0.3 cm wide, glabrous but with minute black punctations, the nodes well spaced. *Leaves* succulent, oblong, 5.0–7.5 cm long, 1.8–3.0 cm wide, widely deltoid toward the apex, acuminate, the acumen to 0.3 cm long, ultimately obtuse, toward the base cuneate, obtuse or rounded, slightly inequilateral, the costa prominulous above, subplane beneath, red on drying, to 0.2 cm wide, the lateral veins ca. 7, arcuate, somewhat inconspicuous, the fine veinlets obscure, the margin lightly revolute, coriaceous, concolorous, smooth, glabrous; petioles to 1 cm long, rigid, glabrous; stipules free, often persistent, compressed-rotund, to 1 cm long, to 1.3 cm wide, with 2 triangular or oblong lobes, ca. 0.5 cm long, the lobes erose or with subulate teeth, the body of the stipule rigidly scarious, glabrous, the raphides dense. *Inflorescences* axillary, the peduncle ca. 1 cm long, ca. 0.3 cm wide, the fruits disposed in a globose head, to 2.5 cm in diam. *Fruits* sessile, oblong, to 1.5 cm long, obtuse or truncate toward the apex, carnose, smooth, glabrous, red, purple toward the apex, the bracts few, large, imbricate, compressed rotund, to 0.8 cm long, perhaps much wider than long, subcoriaceous, glabrous except ciliolate toward the margin, the margin erose, the raphides dense.

Cephaelis gaugeri is known only from Panama. It is named in honor of Mr. George Gauger, a microbiologist in the Canal Zone who has assisted this author in collecting plants in Panama.

The new species is distinguished by its stem being rhizomatous, its leaves being succulent with few, inconspicuous lateral veins, and its stipules being large and lobed.

PANAMÁ: Roads to Cerro Jefe and Altos de Pacora, *Mori et al. 3779* (MO).

12. **Cephaelis glomerulata** Donnell Smith, Bot. Gaz. 16: 12. 1891. TYPE: Guatemala, *J. D. Smith 1637*, not seen.—FIG. 16.

Psychotria glomerulata (Donnell Smith) Steyermark, Mem. N.Y. Bot. Garden 23: 670. 1972.

Subshrubs to 2 m tall, the stem simple above or occasionally with 2 terminal branches, the twiglets terete, glabrous, the nodes well spaced. *Leaves* lanceolate, ovate lanceolate or oblong, occasionally inequilateral, occasionally salicoid, 5–13 cm long, 1.6–5.5 cm wide, deltoid or acute at the apex, acuminate, the acumen

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[14] *Cephaelis gaugeri* Dwyer, spec. nov. *Suffrutices* ad ⅓ m alti rhizomati caule simplici. *Folia* succulentia, oblonga, 5.0–7.5 cm longa, 1.8–3.0 cm lata, versus apicem lato-deltoidea venis lateralibus ca. 7 in sicco evanescentibus, coriacea laevia glabra; petiolis ad 1 cm longis; stipulis compresso-rotundis, ad 1 cm longis, ad 1.3 cm latis, prope medium lobis 2 ad 0.5 cm longis, in margine erosis vel dentibus subulatis praeditis. *Inflorescentiae* axillares, pedunculo ca. 1 cm longo, ca. 0.3 cm lato, fructibus in caespitem globosum ad 2.5 cm dispositis. *Fructus* sessiles oblongi, ad 1.5 cm longi, carnosi, laeves, glabri, rubri.

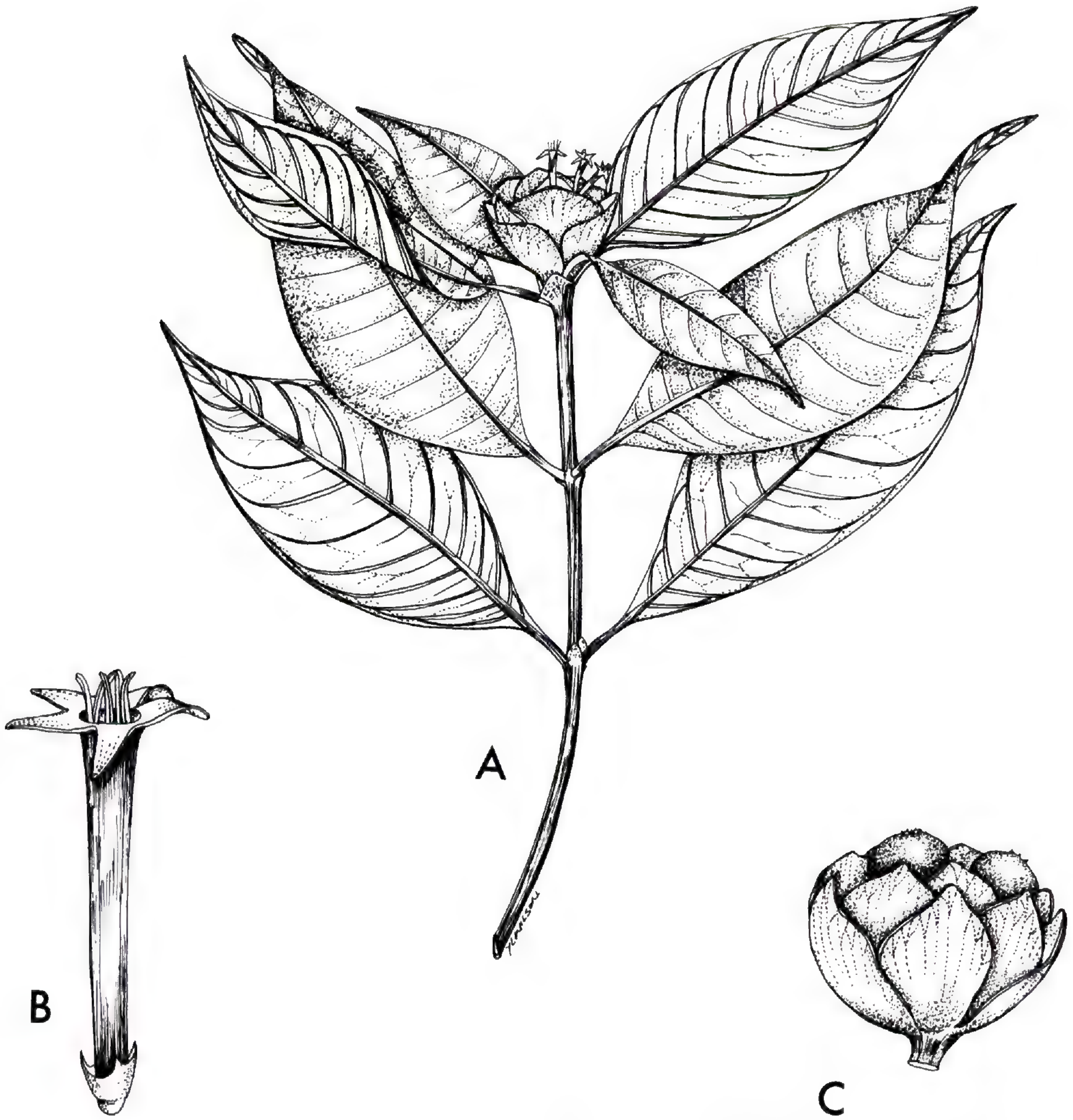

FIGURE 16. *Cephalis glomerulata* Donnell Smith.—A. Inflorescence (×3/5).—B. Flower (×2.4).—C. Fruit (×1.2). [After *Hammel 1819.*]

to 1.5 cm long, ultimately acute or obtuse, cuneate or obtuse at the base, the lateral veins 12–16(–20), widely arcuate, with several smaller veins between adjacent laterals, these soon branching, the intervenal areas spreading reticulate, chartaceous to papyraceous, glabrous, usually lustrous; petioles 0.3–1.5 cm long, glabrous; stipules connate, erect, somewhat inflated, cylindrical, to 3 mm long, truncate, glabrous. *Inflorescences* terminal, sessile or subsessile (the peduncle to 0.5 cm long), the bracts and flowers aggregated into an oblong or compressed rotund head, 1.5–2.5 cm long, often somewhat wider than long, the outermost bracts ovate rotund, to 1.5 cm long, to 1 cm wide, obtuse, rounded or bilobed at the apex, subcoriaceous, glabrous, venose, eglandular within, white or green, turning purple in fruit, with progressively smaller, narrower, and more concave bracts within, each flower enclosed by 2 tightly enveloping bracteoles. *Flowers*

sessile; hypanthium ca. 1 mm long, glabrous, the calycine cup about equal to the hypanthium, delicately petaloid, glabrous, eglandular within, the teeth 5, irregular but mostly subulate or triangular, to 1.2 mm long; corolla white, the tube cylindrical, ca. 1 cm long, petaloid, glabrous outside, puberulent within in the middle of the tube for ca. 4 mm; stamens 5, the anthers subsessile, oblong, 2.2 mm long, obtuse, minutely apiculate, the filaments attached near the middle of the tube; style slender, about as long as the tube, the stigmas 2, dilated, oblong, 1.3 mm long, subplane. *Fruits* fleshy, oblong or subrotund, to 1 cm long, china blue at maturity, glabrous.

Cephaelis glomerulata extends from Guatemala to Panama. "Uasika" (*Duke 14378*).

BOCAS DEL TORO: Punta Peña, near Chiriquicito, ca. 1000 ft, *Lewis et al. 2175* (COL, MO, UC, VEN). Old Bank Island, *Wedel 1930* (MO, US), *1941* (US). Fish Creek, Chiriquí Lagoon, *Wedel 2199* (MO, US). Fish Creek Mountains, *Wedel 2309* (MO, US). Bastimentos, Chiriquí Lagoon, *Wedel 2907* (MO). Isla Colón, *Wedel 2968* (MO, US); *Woodson et al. 1936* (F, MO). CANAL ZONE: Telephone cable trail between splice S16 and S49, Río Indio, *Steyermark & Allen 17428* (MO). Fort Sherman near road to Gatún along Road S-5, *Tyson & Dwyer 1215, 1243* (both MO). COCLÉ: 16.7 km N of turnoff to Coclesito from Llano Grande, *Hammel 1819* (MO). COLÓN: Santa Rita Ridge, *Croat 14143* (MO); *Dwyer 8404, 8413* (both MO); *Dwyer et al. 8995* (MO). Highway to 8 mi E of Santa Rita Ridge, 800 ft, *Dwyer et al. 8986* (MO). Santa Rita Ridge road, *Gentry 1887* (MO). Santa Rita Ridge, *Gentry 8822* (MO); *Lewis et al. 5272* (MO). Santa Rita Ridge, 2.7 mi by gravel road NE of Transisthmian Highway, *Nee & Mori 3675* (MO). PANAMÁ: Road to Cartí, 13 km N of El Llano, *Busey 384* (MO). Cerro Jefe, 5 mi S of Summit, *Busey & Croat 284* (MO). El Llano-Cartí Road, 10 mi from Panamerican Highway, 330 m, *Croat 33756* (MO). Cerro Jefe, *Croat 35869* (MO). Río Sancantí, ca. 2 mi upstream from Piria, ca. 120 m, *Duke 14378* (MO). Goofy Lake, to 8 mi S of Goofy Lake toward Cerro Jefe, *Dwyer 7103* (MO). Between Cerro Jefe and La Eneida, 2100–2900 ft, *Dwyer 8241* (MO). El Llano-Cartí Road, *Folsom 2616* (MO). El Llano-Cartí Road, 12 km N of Panamerican Highway, *Folsom 3597* (MO). Cerro Jefe, ca. 1000 m, *Gentry 6147* (MO). Cerro Jefe, ca. 3100 ft, *Gentry et al. 3459* (MO). Cerro Jefe to La Eneida, *Hayden 1016* (MO, UC). El Llano to Cartí-Tupile, 16 km above Panamerican Highway, *Kennedy et al. 2429* (MO). Altos del Río Pacora, 2500 ft, *Lewis et al. 2262* (COL, DUKE, K, MO, UC, VEN). El Llano to Cartí-Tupile, 300–500 m, *Liesner 1276* (MO). Gorgas Memorial Labs, 5–10 km NE of Altos de Pacora, ca. 600 m, *Mori & Kallunki 3325* (MO). Cerro Jefe, 2700 ft, *Tyson 3373* (MO). VERAGUAS: Mouth of Río Concepción, *Hayden 2806* (COL, DUKE, MO, UC, VEN). 3–4 km W of Santa Fé, 2500 ft, *Nee 11308* (MO). SAN BLAS: Inland from airport at Mandinga, *Duke 8917* (MO).

13. **Cephaelis insueta** Dwyer.[15] TYPE: Panamá, *Mori & Kallunki 3108* (MO, holotype).

Shrubs (?), the stems rhizophorous to the bases of the uppermost leaves, square, dark red when dry, glabrous, the nodes crowded, the petiole scars subrotund, to 0.8 cm long, the pith perhaps porate. *Leaves* sessile, oblong, 17–43 cm long, 8–16 cm wide, widely deltoid at the apex, acuminate, the acumen triangular, ca. 1 cm long, the blade spathulate toward the base, finally subauriculate, the costa subplane above or prominulous, prominent beneath, to 0.3 cm wide, the lateral veins ca. 42, scarcely arcuate, the submarginal veins 2, these somewhat

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[15] *Cephaelis insueta* Dwyer, spec. nov. *suffrutices* (?) caule rhizophoro etiam basibus foliorum superiorium. *Folia* sessilia, oblonga, 17–43 cm longa, 8–16 cm lata, lamina basim versus spathulata ultime subauriculata venis lateralibus ca. 42 vix arcuatis venis submarginalibus 2 margini subparallelibus tenui-chartacea discoloria supra glabra subtus puberula. *Inflorescentiae* terminales ad 16 cm longae, ad 6 cm latae, pedunculo recto, ad 10 cm longo; bracteolis minutis ovato-subulatis, ca. 1 mm longis. *Flores* non visi. *Fructus* elliptico-oblongi, ad 0.9 cm longi, ad 0.4 cm lati, laeves glabri opaco-rubri calyce ca. 1 mm longo.

parallel to the margin, the one nearer the margin inconspicuous, slender, 0.1 mm from the margin, the other prominulous, 1 mm from the margin, the intervenal areas spreading reticulate, thin chartaceous, discolorous, glabrous above, minutely puberulent beneath on the costa and the veins. *Inflorescences* terminal (only one seen in fruit) to 16 cm long, to 0.6 cm wide, puberulent, the peduncle erect, to 10 cm long, to 0.5 cm wide, flattened, the branches few, ascending, the lowermost perhaps opposite, to 4 cm long; bracteoles minute, ovate subulate, ca. 1 mm long. *Flowers* not seen. *Fruits* on short pedicels; elliptic oblong, to 0.9 cm long, to 0.4 cm wide, smooth, glabrous, dark red, the calyx persistent, ca. 1 mm long, each pyrene 4-sulcate.

Cephaelis insueta is known only from Panama. The Latin adjective means "unusual" which seems appropriate as the stem of the new species is rhizophorous even to the apex; the basally spatulate leaves are striking. The 2 very reduced submarginal veins which parallel the margin suggest the situation in e.g. *Faramea talamancarum* Standley. The collectors of the new species note: "detritus collected in the leaf axils penetrated by adventitious roots from the stem."

VERAGUAS: 11 km from Escuela Agricola Alto de Piedra forest along Río Dos Boca, tropical wet forest, Atlantic slope, *Mori & Kallunki 3108* (MO).

14. **Cephaelis ipecacuanha** (Brot.) A. Rich., Bull. Fac. Med. 4: 92. 1818.

Callicocca ipecacuanha Brot., Trans. Linn. Soc. London 6: 137. 1802. TYPE: Brazil, *Gomez*, not seen.
Ipecacuanha officinalis Arruda, Diss. Pl. Brazil 44. 1810. Not seen, reprinted in part as Appendix to Koster, Travels in Brazil 2: 374–375. 1817. TYPE: Described from cultivation.
Evea ipecacuanha (Brot.) Standley, Contr. U.S. Natl. Herb. 18: 123. 1916.
Ouragoga ipecacuanha (Brot.) Farw., Drugg. Circ. 61: 175. 1917.

Subshrubs to 0.25 m tall, the stems simple, arising from a rhizome, to 0.8 cm in diam., the nodes often crowded toward the apex of the stem, and often rough with stipular scars. *Leaves* oblong, obovate oblong, elliptic oblong, oblong subrotund, 8–14 cm long, 3.2–9.0 cm wide, obtuse or rounded at the apex, occasionally widely cuneate, acuminate, the acumen often vague, usually widely triangular, to 1 cm long, basally obtuse, rounded, attenuate acute or cuneate (and the lamina abruptly contracted), occasionally vaguely auriculate, the costa slender, prominulous above and beneath, the lateral veins ca. 6, arcuate, uniting well below the margin to form a submarginal undulate vein, with 1–2 smaller lateral veins between a pair of lateral veins, stiffly papyraceous or chartaceous, glabrous or occasionally sparsely puberulent above and beneath; petioles either absent or to 0.5 cm long, glabrous; stipules persistent, appressed to the stem, thin, oblong or ovate rotund, to 11 mm long, the body 3–5 mm long, with ca. 10 linear subulate awns to 7 mm long, these spreading fanlike or curled, glabrous. *Inflorescences* axillary and/or terminal, glabrous, the peduncles erect or deflexed, 1.2–4.0 cm long, ca. 0.15 cm wide, terminated by a bracteate cluster of flowers, the heads compressed rotund, 1.5 cm in diam., to 3.5 cm wide when bracts spread, the bracts elliptic oblong to subrotund, 8–10 mm long, 3.5–8.0 mm wide, glabrous, stiffly petaloid, with a few marginal, weak, subulate projections at the base, to 1.5 mm long, to 0.2 mm wide basally. *Flowers* sessile, distylous; hypanthium

0.1–0.2 cm long, glabrous, the calycine cup 0.1–0.2 mm long, eglandular within, glabrous, the teeth 5, unequal, irregular, scarious, tending to be triangular, to 0.5 mm long; corolla tube cylindrical, to 4 mm long, petaloid, glabrous outside, puberulent within from filament attachment to the mouth, the lobes 5, oblong or ovate oblong, ca. 1.5 mm long, acute; stamens 5, the anthers exserted or included, narrowly oblong, ca. 1.7 mm long, the filaments short or elongate, attached near the middle of the tube; ovarian disc rotund, ca. 0.3 mm long, the style filamentous, 0.2–0.6 cm long, the stigmas minute. *Fruits* fleshy, red, oblong or rotund, to 1 cm long, the pyrenes smooth, glabrous or with a small ringlike scar.

Cephaelis ipecacuanha is well distributed throughout tropical America. The roots and rhizome contain an alkaloid emetin, an emetic and expectorant. This drug is known in English as "ipecac" or in Spanish as "Raicilla." The United States Pharmacopeia lists Rio or Brazilian ipecac as *Cephaelis acuminata* Karsten, "known in commerce as 'Cartagena, Nicaragua, or Panama ipecac'" which is supposed to have different pharmacological properties from Rio or Brazil ipecac. The name *Cephaelis acuminata* is an unpublished name which may refer to plants which do not occur in Panama. Panamanian material seen to date is quite uniform taxonomically and agrees with other material from South America which has been going under the name *Cephaelis* (or *Psychotria*) *ipecacuanha*.

BARRO COLORADO ISLAND: *Bartlett & Lasser 16723* (MO); *Busey & Croat 237* (MO); *Croat 4096, 4104, 4269, 6609, 12427, 15117* (all MO); *Hayden 122, 127, 155, 1037* (all MO); *Starry 55* (MO). DARIÉN: Punta Alegre, *Ambulo* (MO). Río Tuira and Río Paca, *Duke 5027* (MO). Line CC, *Duke 5237* (MO). Río Chucunaque, 2–10 mi above Cuna-Darién border, *Duke 8566* (MO). Without other locality, *Sexton 146A, 146B* (both MO). SAN BLAS: Headwaters of Río Mulatupo, *Elias 1770* (MO).

15. **Cephaelis kennedyi** Dwyer.[16] TYPE: Panamá, *Kennedy 1779* (MO, holotype).

Subshrubs to 2 m tall, the branchlets terete, smooth, glabrous, the nodes well spaced. *Leaves* narrowly oblong or obovate oblong, 4–9 cm long, 0.8–3.0 cm wide, obtuse toward the apex, often abruptly acuminate, the acumen to 1 cm long, often falcate, ultimately obtuse or acute, basally acute or cuneate, slightly inequilateral, the costa prominulous above, prominulous beneath, ca. 0.35 mm wide, the lateral veins ca. 20, widely arcuate, subprominent, chartaceous, glabrous; petioles to 1 cm long, 0.8 mm wide, glabrous; stipules connate, the sheath cupshaped, to 2 mm long, truncate, with narrowly subulate bodies, to 1 mm long, yellow when dry, with 2 terminal subulate bristles arising immediately below the margin of the sheath, these bifid above the middle, often longer than the sheath. *Inflorescences* terminal, sessile or subsessile, capitate, oblong, to 0.6 cm long,

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[16] *Cephaelis kennedyi* Dwyer, spec. nov. *Suffrutices* ad 2 m alti, glabri. *Folia* angusto-oblonga, 4–9 cm longa, 0.8–3.0 cm lata, abrupto-acuminata acumine ad 1 cm longo, venis lateralibus ca. 20, chartacea glabra; petiolis ad 1 cm longis; stipulis connatis vagina cupuliformi, ad 2 mm longa, truncata setis 2 subulatis statim infra marginem vaginae affixis saepe quam vagina longioribus eis supra medium bifidis. *Inflorescentiae* sessiles vel subsessiles terminales capitato-oblongae, ad 0.6 cm longae, ad 0.5 cm latae, bracteis exterioribus ad 6 mm longis, ca. 4 mm latis. *Flores* cupula calycis ca. 0.5 mm longa, truncata dentibus nullis vel 5 punctis minutis praedita vel dentibus 2 longitudine inaequalibus, ad 0.3 mm vel dente uno; corolla tubo ad 3.2 mm longo; antheris oblongis, ca. 1 mm longis. *Fructus* non visi.

to 0.5 cm wide, outer bracts 2, oblong, 5.5–6.0 mm long, ca. 4 mm wide, obtuse, subcoriaceous, glabrous, subplane, with numerous fimbriate glands within at the base; interior bracts 2, somewhat stiff, concave, with a few basal bristles; flowers 8–10, each flower enclosed in 3 bracteoles. *Flowers* with the hypanthium to 0.5 mm long, the calycine cup 0.5 mm long, somewhat swollen, stiffly petaloid, glabrous, rigidly petaloid, the teeth variable, sometimes absent, sometimes disposed as 5 minute points, sometimes with 2 unequal teeth, to 0.3 mm long, sometimes with one tooth and sometimes the margin with one oblong petaloid obtuse lobe to 2.5 mm long, and to 1.5 mm wide; corolla with the tube cylindrical and inflated, to 3.2 mm long, rigidly petaloid, glabrous without, barbate within near the filament attachment region, the lobes 5, the anthers oblong, ca. 1 mm long, the filaments linear, attached above the middle of the tube; style to 0.1 mm long, the stigmas 2, 0.2 mm long, the ovarian disc compressed rotund, 0.6 mm long, conspicuously 2-lobed. *Fruits* not seen.

Cephaelis kennedyi is named in honor of Dr. Helen Kennedy, a student of the flora of Panama. The new species is known only from Panama. It is clearly distinguished from its closest relative, *C. mucosa* (Jacq.) Sw., by its much reduced heads and its calycine cup either lacking teeth or exhibiting a great range of variability in the shape and in the size of the teeth. A bladelike lobe on the calyx cup of one flower may be an anomaly.

PANAMÁ: 6 km from above the Panamerican Highway on the road from El Llano to Cartí-Tupile, *Kennedy 1779* (MO). SAN BLAS: trail to Darién from Puerto Obaldía, 10–15 km WSW of Puerto Obaldía, *Mori et al. 6859* (MO).

16. **Cephaelis latistipulata** Standley, J. Wash. Acad. Sci. 18: 281. 1928. TYPE: Costa Rica, *Standley 39695* (US, holotype; F, photo).

Subshrubs to 1.5 m tall, the stems unbranched, somewhat angular, glabrous, the internodes well spaced. *Leaves* obovate, elliptic or ovate, 14–21 cm long, (0.5–)7–9 cm wide, rounded or obtuse at the apex, the acumen short, acute and somewhat decurrent on the petiole at the base, the costa prominent, the lateral veins 11–12, coriaceous, smooth, glabrous; petioles elongate, to 7 cm long; stipules persistent, kidney shaped or round, 0.8–2.2 cm long, to 2 cm wide, briefly bilobed at the apex, the margin undulate and serrate, the lobes to 10 mm long, acute. *Inflorescences* in axillary heads, to 1.5 cm long, to 2 cm wide, the peduncle obsolete; involucral bracts 5, ovate or oblong, to 1.5 cm long, to 1.2 cm wide. *Flowers* sessile, the calycine cup with 5 teeth, these lanceolate, 2–5 mm long, pilose, denticulate; corolla funnel shaped, 4–6 mm long, glabrous or elongate pilose outside, white pilose within near the mouth, the lobes triangular, 1–2 mm long, pilose marginally; stamens subsessile, the anthers oblong, ca. 1 mm long; ovarian disc deeply bilobed, the style 3–5 mm long, glabrous or pilose, the stigmas 1 mm long. *Fruits* not seen.

Cephaelis latistipulata is known from Costa Rica and Panama. I have drawn freely on Molina's (1951) description of the flower in the above diagnosis and his description of the bracts and bracteoles reads: "brácteas involucrales 5, coriáceas, enteras o bipartidas, corto-pilosas en ambas caras, obtusas o acuminadas, ovadas o anchamente oblongas, de 12–15 mm de largo, de 10–12 mm de ancho,

brácteas internas numerosas, pilosas por ambas caras, agudas o acuminadas, obovadas, márgenes sencillo-pilosos, de 10–12 mm de largo, 6–10 de ancho, bractéolas lineares o oblanceoladas, subcoriáceas, pilosas por ambas caras, de 6–7 mm de largo, de 1–3 cm de largo."

CHIRIQUÍ: Caná-Cuasí Trail, *Terry 1481* (F).

17. **Cephaelis nana** (Standley) Standley, J. Wash. Acad. Sci. 17: 171. 1927.

Evea nana Standley, J. Wash. Acad. Sci. 15: 105. 1925. TYPE: Panamá, *Standley 27550* (US, holotype; F, isotype).

Subshrubs less than 1 m tall, unbranched, glabrous, the internodes relatively short. *Leaves* elliptic to oblong, 9–22 cm long, 5–10 cm wide, obtuse to acuminate at the apex and the base, the lateral veins prominent, ca. 15, subcoriaceous, drying green; petioles to 4 cm long; stipules persistent, deeply bilobed, the narrow lobes 4–6 mm long, usually obtuse. *Inflorescences* solitary, terminal, subsessile or the peduncles to 4 cm, subglobose, to 1.5 cm long, to 3 cm wide, containing 3–5 heads; outermost bracts involucral, obovate or spatulate, acute or rounded at the apex, to 1.5 cm long, to 1.5 cm wide, free, purple, membranous, the internal bracts oblanceolate or spatulate, rarely narrowly oblong, to 1.2 cm long, to 0.6 cm wide, frequently with minute teeth at the base. *Flowers* not seen. *Fruits* subglobose, to 1 cm long, to 1 cm wide, fleshy, blue, the pyrenes ovoid or elliptic oblong, ca. 0.5 cm long.

Cephaelis nana is known only from Nicaragua and Panama.

CANAL ZONE: Hills N of Frijoles, *Standley 27550* (F, US).

18. **Cephaelis panamensis** Dwyer.[17] TYPE: Panamá, *Mori & Kallunki 3714* (MO, holotype).

?*Shrubs*, the branchlets woody, smooth, glabrous, the nodes swollen, well spaced except crowded at the apex of the branchlet. *Leaves* usually sessile, verticillately disposed at the apex of the branchlet, elliptic or obovate oblong, 15–28 cm long, 7.5–15.0 cm wide, acute or deltoid at the apex, the base 1–2 cm wide, conspicuously truncate, often somewhat auriculate, the costa prominulous above, prominent beneath, to 0.3 cm wide, the lateral veins 15–17, strongly prominulous beneath, the lowermost often strict, the upper arcuate, the undulate submarginal vein inconspicuous, the intervenal areas patulous reticulate, the smaller veins pinnatiform, chartaceous, concolorous, green when dry, minutely puberulent beneath; petioles absent or to 1.3 cm long, lignose, to 0.3 cm wide; stipules deciduous, the scars conspicuous, to 6 mm long, to 2.5 mm wide. *Flowers* not seen. *Inflorescences* terminal, the fruits massed into a rounded head, to 3 cm in diam., the peduncle absent, the outermost bracts apparently few, triangular oblong, to

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[17] *Cephaelis panamensis* Dwyer, spec. nov. ?*Frutices* ramulis glabris. *Folia* apice ramuli verticillatim dispositia elliptica vel obovato-elliptica, 15–28 cm longa, 7.5–15.0 cm lata, basi 1–2 cm lata conspicue truncata saepe auriculata venis lateralibus 15–17 chartacea glabra infra minuto-puberula; petiolis nullis vel ad 1.3 cm longis. *Inflorescentiae* terminales fructibus congestis caespite rotundo, ad 3 cm diam. pedunculo nullo. *Fructus* sessiles oblongi, ad 1.2 cm longi, glabri.

1.7 cm long, rigid, glabrous except ciliolate at the apex. *Fruits* sessile, oblong, rotund or truncate at the apex, to 1.2 cm long, smooth, glabrous, blackish green when dry, the calycine cup bowl shaped, ca. 1.5 mm long, to 2.5 mm wide, truncate, not lobed, rigid, minutely ciliolate, each pyrene drying tan brown with a slender median groove.

Cephaelis panamensis is known only from Panama. Unfortunately flowers were not collected and I am not certain that the species belongs in *Cephaelis*. The conglomerate inflorescences appear to be subtended by several bracts. The fact that some leaves are sessile and are basally truncate or vaguely auriculate is diagnostic. The relatively large fruit is more suggestive of *Cephaelis* than of *Psychotria*. The calycine cup is toothless and somewhat bowl-shaped.

COLÓN: Río Guanche, ca. 2.5 km upriver from bridge on road to Portobelo, tropical wet forest along small creek to the S of the river, 10–100 m, *Mori & Kallunki 3714* (MO).

19. **Cephaelis panchocoënsis** Dwyer.[18] TYPE: Panamá, *Gentry & Mori 13895* (MO, holotype).

Succulent *subshrubs*, to 0.75 m tall, the stems somewhat smooth, glabrous, drying red, the superior nodes well spaced. *Leaves* elliptic or obovate elliptic, 10–35 cm long, 3.5–14.0 cm wide, rounded or obtuse toward the apex, acuminate, the acumen short and wide, to 1 cm long, acute or attenuate acute basally, the costa immersed above, prominent beneath, the lateral veins 20–38, plane or prominulous above, leaving the costa at almost right angles and arcuate only near the margin or strict and sharply ascending, prominulous and conspicuous beneath, arcuate, the undulate submarginal vein 2–8 mm from the margin, not conspicuously undulate on proximal portion of the blade, the smaller veins inconspicuous, the intervenal areas smooth, chartaceous to subpapyraceous, discolorous, drying red to brown beneath, glabrous and minutely farinose above, minutely puberulent especially on the veins beneath; petioles absent or to 1 cm long; stipules free, ovate lanceolate, to 1.6 cm long, ca. 0.6 cm wide, obtuse?, drying red, subcoriaceous, apparently glabrous. *Inflorescences* terminal, capitate, 2–4 cm long, 2–6 cm wide, the head appearing solitary or of 2–6(or more?) smaller heads aggregated tightly into a unit head on suppressed branches or several heads on 3 branches terminating a peduncle to 2.5 cm long, stout, to 4 mm wide, glabrous, drying red; bracts numerous, involucral, the outermost oblong, to 2 cm long, about ½ as wide as long, obtuse, stiff, venose, glabrous, the margin irregular, callose, drying tan, with a few glands within. *Flowers* sessile, the hypanthium ca. 1 mm long, glabrous, the calycine cup cylindrical, to 3.5 mm long, the teeth

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[18] *Cephaelis panchocoënsis* Dwyer, spec. nov. *Suffrutices* succulenti. *Folia* elliptica, 10–35 cm longa, 3.5–14.0 cm lata, versus apicem rotundata vel obtusa venis lateralibus 20–38 chartacea ad subpapyracea subtus rubra ad brunnea supra glabra sed farinosa subtus in venis minuto-puberula; petiolis nullis vel 1.0–4.5 cm longis; stipulis ovato-lanceolatis, ad 1.6 cm longis, ca. 0.6 cm latis. *Inflorescentiae* terminales capitatae, ad 6 cm longae, glabrae pedunculo nullo vel ad 2.5 cm longo saepe ramis tribus ad 1.5 cm longis terminato, floribus in unum caespitem ad 2.2 cm in diam. vel in caespites plures dispositis. *Flores* subsessiles; hypanthio glabro cupula calycis cylindrica, ad 3.5 mm longa; corolla alba tubo gracili, ca. 10 mm longo extus glabro; antheris ca. 2 mm longis. *Fructus* partim bracteolis inclusi, oblongi, ad 8 mm longi, leviter costati glabri, calyce ad 3 mm longo.

5, short, obscured by the ciliate margin, the cup glabrous with a few glands within, these polymorphic, narrow oblong to ovate oblong, to 1.2 mm long; corolla white, narrowly cylindrical, to 10 mm long, ca. 0.6 mm wide in the middle, glabrous outside, villosulose within near the mouth, the lobes 5, oblong, to 3 mm long, attenuate above the middle with a minute adaxial projection ca. 1 mm below the apex; stamens 5, the anthers narrowly oblong, to 2 mm long, subsessile, attached just below the mouth; ovarian disc oblong, to 0.8 mm long, drying black; style linear, ca. 14 mm long, the stigmatic area scarcely wider than the style, to 2 mm long. *Fruits* oblong, to 8 mm long, ca. 4 mm wide, glabrous, red, lightly costate, the calyx cup persistent or deciduous.

Cephaelis panchocoënsis is known only from Panama and Colombia. It is recognized by its many-veined leaves and terminal capitate inflorescences. The leaves dry a pink red beneath, have the lateral veins either leaving the costa at right angles or strict and sharply ascending. The undulate submarginal vein of the blade becomes subparallel to the margin on the lower ¼ of the blade. Another diagnostic character is the callose margin of the bracts. The flowers appear to be few per head. My description of the flower is based on *Gentry et al. 16756*. The calycine cup is strikingly elongate with several glands within. On dissecting the calycine cup of the fruit of *Gentry 4767*, I observed several triangular glands regularly arranged at the base of the cup; these I was unable to find in dissecting the calycine cup of *Gentry 16756*. The style is noteworthy in being linear and extending beyond the elongate corolla tube. The new species is related to *Cephaelis dressleri* Dwyer, described as new in this paper. *Cephaelis panchocoënsis* is an upland species, while *C. dressleri* is a lowland species.

PANAMÁ: DARIÉN: La Boca de Pirre, *Bristan 1277* (MO). Cerro Pirre base camp on Río Perrecénega, *Gentry 4767* (MO). S slope of Cerro Tacarcuna above Río Pucro base camp, 700–1000 m, *Gentry & Mori 13895* (MO). E of Tres Bocas, shortest headwater of Río Cuasí, *Kirkbride & Duke 1198* (MO). COLOMBIA: CHOCO: Upper Río Tigre near base of Serrania del Darién, E of Unguia, 250–300 m, *Gentry et al. 16756* (MO).

20. **Cephaelis tomentosa** (Aubl.) Vahl, Eclog. Amer. 1: 19. 1796.

Tapogomea tomentosa Aubl., Hist. Pl. Guiane 160. 1775. TYPE: not seen.
Psychotria poeppigiana Muell.-Arg. in Mart., Fl. Bras. 6(5): 370. TYPE: not seen.
Evea tomentosa (Aubl.) Standley, Contr. U.S. Natl. Herb. 18: 123. 1916.

Shrubs to 2 m tall, the branches terete, ultimately angular, golden hirsute or villose, often constricted below the nodes. *Leaves* lanceolate or ovate lanceolate, 8–23 cm long, 3–9 cm wide, acute at the apex, attenuate acuminate, the acumen to 2 cm long, acute, rounded or obtuse at the base, the costa prominulous above and beneath, the lateral veins 9–12, arcuate, the intervenal areas spreading reticulate, membranous to chartaceous, densely golden villose above and beneath; petioles to 2 cm long, densely hairy; stipules connate, usually persistent, cylindrical, the sheath 2–6 mm long, truncate or tapering toward the apex, each part usually with 2 erect narrowly subulate awns to 11 mm long, usually twice the length of the sheath, densely hirsute. *Inflorescences* terminal, 5–6 cm wide, the flowers conglomerate, the head subtended by numerous bracts, the outer pair large, flaring, deep red; peduncles 2.5–7.0 cm long, densely villose. *Flowers* with the hypanthium short, pubescent, the calycine cup scarcely measurable, the lobes

5, narrowly oblong or narrowly triangular subulate, to 2 mm long, petaloid, with a linear oblong gland at the sinuses to 0.5 mm long; corolla yellow, the tube narrowly cylindrical to 13 mm long, somewhat expanded near the mouth, petaloid, densely elongate ciliate outside, barbate inside ca. 3 mm below the filament attachment, the lobes 5, triangular, ca. 3 mm long; stamens 5, the anthers subsessile, narrowly oblong, 2.5–3.5 mm long, attached at the mouth, usually slightly exserted; style slender, included or barely exserted, the stigmas digitiform, scarcely wider than the style, ca. 2.5 mm long. *Fruits* berrylike, bright blue, rotund to broadly oblong, less than 1 cm in diam.

Cephaelis tomentosa is well distributed throughout tropical America. Standley (1938) remarked that ". . . in most herbaria (it) is represented by more specimens than perhaps any other tropical member of the family. Oddly enough I have not seen any herbarium material from the Province of Chiriqui, Panama; undoubtedly it occurs there." "Uasika" (Cuna, fide Standley).

BOCAS DEL TORO: Santa Catalina, *Blackwell et al. 2805* (COL, DUKE, MO, UC, VEN). Almirante, near Nigra Creek, *McDaniel 5050* (MO). Water Valley, *Wedel 811* (MO). Chiriquí Lagoon, *Wedel 1081, 1279* (both MO). Water Valley, Chiriquí Lagoon, *Wedel 1744* (MO). Old Bank Island, Chiriquí Lagoon, *Wedel 2118* (MO). Little Bocas, Chiriquí Lagoon, *Wedel 2534* (MO). BARRO COLORADO ISLAND: *Aviles 31* (MO); *Croat 4364* (MO); *Ebinger 612* (MO); *Shattuck 53, 531, 1045* (all MO); *Starry 155* (MO); *Woodson & Schery 987* (MO). CANAL ZONE: Crossing of Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16344* (MO). Near Juan Mina, *Bartlett & Lasser 16556* (MO). Cerro Viejo on K 16 C, *Blum 1224* (MO). Chagres, 4 mi S of river, *Busey 389* (MO). Madden Forest Reserve, *Candido F. 1* (MO). Pipeline Road, 0.2 mi N of ATTC Gate, *Croat 4697* (MO). Pipeline Road near Gatun Lake, *Croat 4704* (MO). Radar Station Road 1 mi N of Summit Garden, *Croat 10276* (MO). Madden Forest SE of Río Pedro Miguel, *D'Arcy & D'Arcy 6099* (MO). Río Azote Caballo, Sabanas, *Dodge et al. 16844* (MO). Hill C-6, Ft. Sherman, *Duke 4401* (MO). George Greene Memorial, Las Cruces Trail, *Dwyer 6755* (MO). Chagres, *Fendler 177* (MO). Gatún Station, *Hayes s.n.* (MO). Road between Gamboa and Summit Gardens, *Kennedy 2257* (MO). Pipeline Road, *Kennedy & Andrews 1896* (MO). Navy Reservation N of Gamboa, *Robyns 65-54* (MO). Las Cruces, *Seibert 577* (MO). Pipeline Road, *Stern & Chambers 18* (MO). 6 mi N of Gamboa, *Tyson 1510* (MO). 7 mi N of Gamboa, *Tyson 6635* (MO). Fort Sherman, *Tyson & Blum 1679* (MO). 1 mi N of Summit Garden, *Tyson & Blum 1968* (MO). COCLÉ: El Valle, *Aguilar CH3* (MO). Cerro Pilón, 700–900 m, *Duke 12184* (MO). La Mesa, El Valle, *Folsom & Butcher 2807* (MO). Ft. Cerro Pilón, ca. 2000 m, *Porter et al. 4584* (MO, SCZ). Cerro Valle Chiquito, 700–800 m, *Seibert 505* (MO). El Valle de Antón, 650–700 m, *Woodson & Schery 171* (MO). Las Margaritas and El Valle, *Woodson et al. 1297* (MO). COLÓN: Juan Mina Plantation, Río Chagres, *Allen 4109* (MO). Santa Rita Ridge, East Ridge, *Dwyer & Correa 8405* (MO). Santa Rita, N of Agua Clara Rain Gauge, *Kennedy 2764* (MO). Santa Rita Ridge, *Lewis et al. 5263* (COL, MO, SCZ, UC, VEN). 0.7 mi NE of Río Piedras Bridge, Pilón to Portobelo, *Nee & Mori 3654* (MO). 8 km NE of Santa Rita, ca. 650 ft, *Wilbur & Weaver 10840* (MO). DARIÉN: Headwaters of Río Chico, 500–750 ft, *Allen 4598* (MO). Río Chico, across from Boca de Tesca, *Duke 5214* (MO). Pico Piriaque, *Duke 8138* (MO). Río Sancanti, 2 mi upstream from Piria, ca. 120 m, *Duke 14383* (MO). Puerto St. Dorothea, *Dwyer 2228, 2255* (both MO). Quebrada "Camachimuricate" near Casa de Bartolo, *Kennedy 2861* (MO). Manené to Mouth of Río Cuasí, *Kirkbride & Bristan 1543* (MO). Caná, 1750 ft, *Stern et al. 654* (MO). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2240* (COL, DUKE, UC, VEN). PANAMÁ: Road to Nuevo Emperador, *Austin 19* (MO). Cerro Azul, *Carrasquilla 198* (MO); *Castrejon 39* (MO). Cerro Campana, *Croat 12139* (MO). Nuevo Emperador, *De Garcia 30* (MO). Near Jenené, *Duke 3882* (MO). Panamá Viejo, *Duke 5730* (MO). Cerro Jefe, *Duke 9459* (MO). Cerro Azul, ca. 2000 ft, *Dwyer 2124, 3074* (both MO). Cerro Campana, ca. 3000 ft, *Dwyer & Kirkbride 7854* (GH, MO); *Ebinger 337* (MO). Cerro Azul, *Ebinger 986* (MO). Nuevo Emperador, *Fernandez 116* (MO). Cerro Jefe, *Ferris 160* (MO). Cerro Campana, *Gentry 1829* (MO). Río Maestro, 2 mi from coast, *Gentry 2205* (MO). Cerro Azul, *Gomez-Pompa et al. 3394* (MO); *Guerra 6* (MO). Nuevo Emperador (Arraíjan), *Guerra 9* (MO). Las Guacas, *Kant 41* (MO). 16 km above Panamerican Highway, road from El Llano to Cartí-Tupile, ca. 350–400 m, *Kennedy 2531* (MO). Peluca Meterological Station, *Kennedy & Dressler 2976* (MO). 12–16 km above Panamerican Highway, El Llano to Cartí-Tupile Road, *Kennedy et al. 3128* (MO). 2–3 mi S of Goofy Lake, *Lewis et al. 261* (F, GH, K, MO, NY, PA, UC, US). Cerro Campana, *Lewis et al.*

1920 (GH, MO, UC, US). Altos del Río Pacora, 2500 ft, *Lewis et al. 2302* (MO, UC). Cerro Campana, *McDaniel 6887* (MO). Cerro Jefe, *Mori 7108* (MO). Cerro Campana, 45 km SW of Panama City, *Mori & Bolten 7687* (MO). Road past Cerro Azul, *Mori & Kallunki 2182A* (MO). 4.5 km N of Lago Cerro Azul, 675 m, *Nee 7037* (MO). Cerro Azul, *Porter et al. 4110* (MO, SCZ, UC, VEN). Cerro Campana, *Porter et al. 4160, 4246* (both MO). Capira, *Saldaña 6* (MO). Cerro Jefe, *Tyson 3441, 3590* (both MO). Cerro Campana, *Webster & Breckon 16505* (MO). Cerro Jefe, *Wilbur & Weaver 11096* (MO). Arraíjan, *Woodson et al. 777, 1400* (both MO). SAN BLAS: Between Río Diablo and Río Acuatí, *Duke 14893* (MO). VERAGUAS: Cerro Tuti, *Folsom & Edwards 3343* (MO).

21. **Cephaelis vultusmimi** Dwyer.[19] TYPE: Panamá, *Gentry & Dwyer 4811* (MO, holotype).—FIG. 17.

Subshrubs to 0.5 m tall, the stem smooth, black or dark brown when dry, pilose, the hairs golden, slender, to 2 mm long, the nodes well spaced. *Leaves* oblong or oblong lanceolate, 9–15 cm long, 3–9 cm wide, deltoid or acute at the apex, acuminate, the acumen to 2.5 cm long, obtuse or truncate at the base, rarely subacute, often conspicuously inequilateral, the costa prominulous above, prominent beneath, the lateral veins ca. 11, strongly arcuate, subprominent beneath, not forming an undulate submarginal vein, rigidly chartaceous, bullate but not drying bullate, concolorous, green with weak curled hairs above, often with withered stiffer and more elongate hairs beneath, those along the costa to 2 mm long, perpendicular; petioles 0.5–1.8 cm long, to 0.3 cm wide; stipules persistent, erect or spreading, free, the body rotund, the lobes 2, erect, widely subulate, 1.5–2.0 cm long, to 0.4 mm wide at the base, caudate tipped, scarious, densely golden hirsute, the hairs to 2 mm long. *Inflorescences* terminal, solitary, the peduncle to 8 cm long, to 0.5 cm wide including the hairs, densely golden-hirsute or barbate, the hairs to 2 mm long, the head ca. 5 cm wide; the large exterior bracts connate toward the base, triangular to 3.5 cm long, to 4.5 cm wide, bright red toward the base, purple to yellow in the middle, green toward the apex, venose, ciliate on both sides, the hairs similar to those of the leaves. *Flowers* with the calycine teeth triangular, unequal, to 1 mm long, hirsute marginally with a gland between adjacent teeth, these to ⅓ the length of the tooth.

Cephaelis vultusmimi is known only from Panama. It is the only new species in this paper without either a complete floral description or a fruit description. The inflorescence as found within the outermost bracts is very immature. I located one bud in which only the hypanthium and the calycine teeth were obvious. The corolla was very immature and little was discernible except the fact that the hairs were very dense. The bracts are strikingly unique and are suggested by the specific name *vultusmimi* (clown's face). The leaves when seen in the field were bullate; this feature was lost in drying. A 2 × 2 Ektachrome of the species has been deposited in the herbarium of the Missouri Botanical Garden.

COLÓN: Santa Rita Ridge Road, E. ridge, *Gentry & Dwyer 4811* (MO).

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[19] *Cephaelis vultusmimi* Dwyer, spec. nov. *Suffrutices* ad 0.5 cm alti, caule dense piloso. *Folia* oblonga vel oblongo-lanceolata, 9–15 cm longa, 3–9 cm lata, apice deltoidea vel acuta, acumine ad 2.5 cm longo, venis lateralibus ca. 11, rigido-chartacea, dense hirsuta; petiolis 0.5–1.8 cm longis; stipulis liberis lobis 2 erectis lato-subulatis, 1.5–2.0 cm longis, apicem versus caudatis, dense hirsutis. *Inflorescentiae* terminales solitariae forma *Cephaelis tomentosa* simili bracteis exterioribus conspicue variegatis rubris purpureis luteis viridibusque.

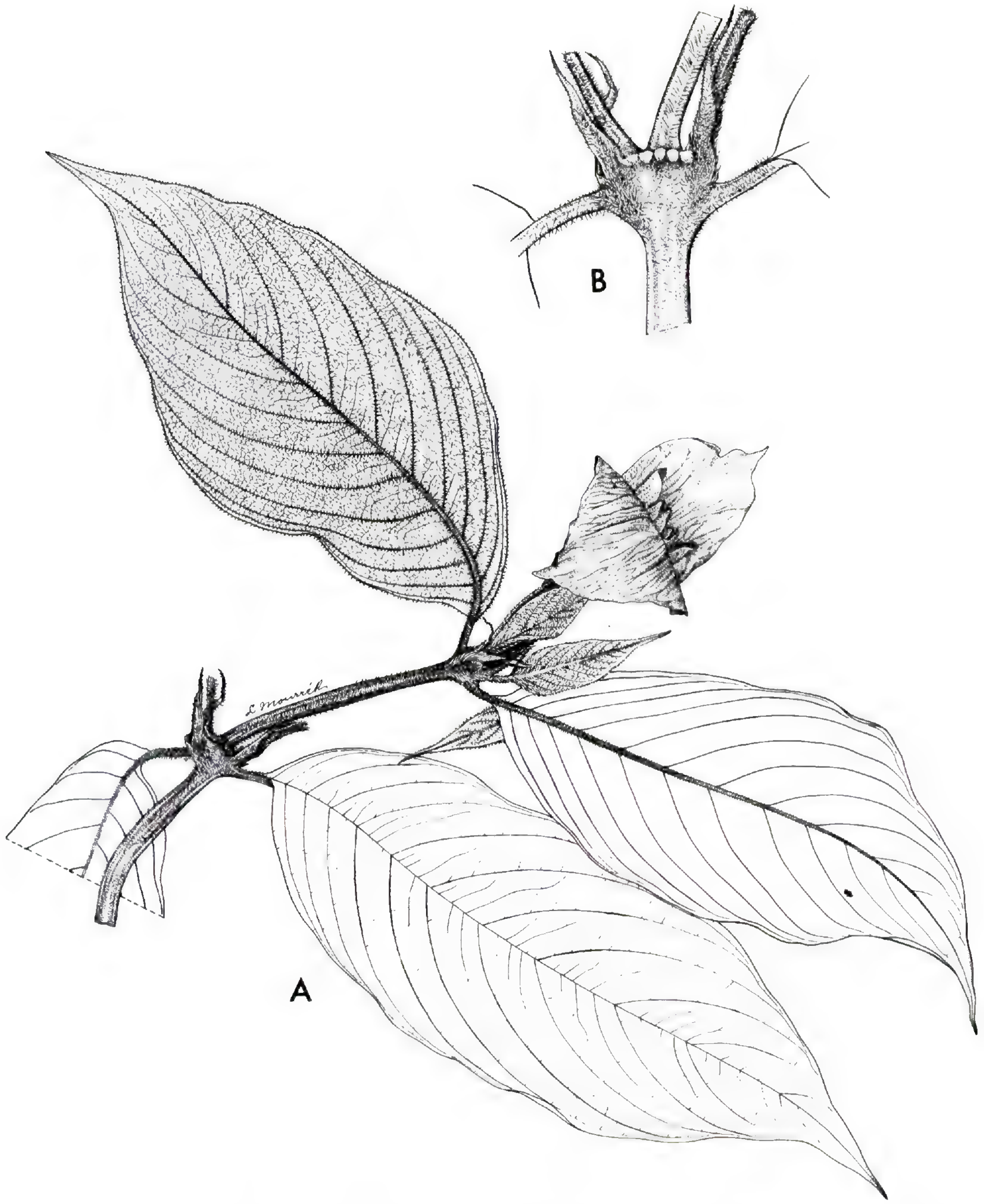

FIGURE 17. *Cephaelis vultismimi* Dwyer.—A. Habit (×½).—B. Vegetative node (×1). [After *Gentry & Dwyer 4811*.]

16. CHIMARRHIS

Chimarrhis Jacq., Sel. Stirp. Amer. 61. 1763. TYPE: *C. cymosa* Jacq.

Pseudochimarrhis Ducke, Arch. Jard. Bot. Rio de Janerio 3: 255. 1922. TYPE: *P. turbinata* (A. P. DeCandolle) Ducke (= *Chimarrhis turbinata* A. P. DeCandolle).

Trees. *Leaves* crowded at the apex of the branchlets; stipules caducous. *Inflorescences* axillary, corymbose cymose, bracteate. *Flowers* small, odoriferous;

calyx cup campanulate, reduced, truncate or dentate; corolla white, the tube short and broad, villous within, the lobes 5, valvate in bud; stamens 5, inserted in the throat, the anthers dorsifixed, the filaments often exserted, villous at the base; style short, the stigmas 2, obtuse, ovules numerous on an axile peltate placenta. *Fruits* capsular, small, oblong, dehiscent, septicidally into 2 valves, each valve ultimately divided; seeds numerous, compressed, reticulate, the endosperm fleshy.

Chimarrhis, a genus of about 14 species, is found in the West Indies, Costa Rica, Panama, and in South America.

a. Leaves 10–20 cm long, 6–11 cm wide; stipules 20–30 mm long; fruits ca. 5 mm long ..... 1. *C. latifolia*

aa. Leaves 3.5–9.5 cm long, 2–5 cm wide; stipules to 11 mm long; fruits ca. 2 mm long ..... 2. *C. parviflora*

1. **Chimarrhis latifolia** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 265. 1929. TYPE: Panamá; *Cooper & Slater 260* (F, US).

Trees to 25 m tall, the wood yellow, the buttresses high, the ultimate branchlets angular, smooth, glabrous; nodes well spaced, the stipular scars ringlike, often drying black, the leaf scars ±0.5 cm in diam. *Leaves* widely elliptic to elliptic oblong, 10–20 cm long, 6–11 cm wide, rounded at the apex, short acuminate, the acumen widely triangular, ca. 0.5 cm long, obtuse, basally cuneate to abruptly attenuate acute, the costa prominulous above, prominent beneath, ca. 0.2 cm wide, rubescent, the lateral veins ca. 10, arcuate, conspicuous above and beneath, uniting to form an undulate submarginal vein, to 0.3 cm from the margin, stiffly papyraceous to thin coriaceous, discolorous, drying dark chocolate above, liver colored beneath, somewhat lustrous, glabrescent; petioles to 4 cm long, angular, twisted, glabrous; stipules deciduous, ovate, 2–3 cm long, acute, thin coriaceous, rubescent. *Inflorescences* axillary, paniculate, to 12 cm long, to 11 cm wide, the peduncle to 6 cm long, the branches disposed in a fan, to 3 cm long, the branchlets in a fan, the corymbs densely flowered. *Flowers* short pedicellate to subsessile; hypanthium turbinate, ca. 2 mm long, glabrous, rubescent, the calycine cup to 0.8 mm long, somewhat expanded, stiffly petaloid, glabrous, teeth absent; corolla white, the tube compressed cylindrical, ca. 2 mm long, stiffly petaloid, rubescent, glabrous outside, white pubescent within above attachment of the filaments, the lobes 5, oblong, longer than the corolla tube, obtuse, puberulent within; stamens 5, the anthers ovate oblong, ca. 1 mm long, versatile, the filaments to 4 mm long, tapering to apex, ca. 0.35 mm wide in middle, bearded adaxially along lower ⅔, attached near the corolla mouth; style to 3.5 mm long, basally narrow, expanded above, the stigmatic lobes oblong rotund, ca. 1 mm in diam., crassate. *Fruits* capsular, bivalvular, to 5 mm long, the outer part forming a skirt-like structure enclosing the valves, striate, glabrescent.

Chimarrhis latifolia is known from Costa Rica and Panama. The flowers were described from *Allen 6302* (MO), Jalaca Station, Province of Puntarenas, Costa Rica, which is close to the Province of Chiriqui in Panama. Standley did not describe the flowers in his original diagnosis.

The wood was described by the collectors as "yellow, heavy and hard to split, the grain very crooked and crossed." "Jagua amarilla."

CHIRIQUÍ: Progreso, *Cooper & Slater 260* (F, holotype; US, isotype).

2. **Chimarrhis parviflora** Standley, Trop. Woods 11: 26. 1927. TYPE: Panamá, *Cooper & Slater 120* (US, holotype; F, NY, isotypes).—FIG. 18.

Trees to 18 m tall, the branches smooth, terete, glabrous, ultimately angular, the nodes well spaced. *Leaves* oblong, 3.5–9.5 cm long, 2.5 cm wide, acute and short acuminate at apex, acute or cuneate at the base, scarcely inequilateral, the costa subplane to prominulous above, subprominent beneath, the lateral veins 9–11, at first strict, then arcuate toward the margin, the intervenal areas smooth, the veinlets inconspicuous, papyraceous, scarcely discolorous, drying chocolate brown above, glabrous above, appressed villose especially on the costa and the veins beneath; petioles 0.5–1.6 cm long, scarcely pubescent; stipules free, narrowly triangular, to 11 mm long, densely appressed pubescent and farinose outside, glabrescent within. *Inflorescences* axillary or pseudoterminal, to 4 per axil, minutely puberulent, cymose paniculate, to 15 cm long, to 9 cm wide, the peduncle when present 4–9 cm long, arcuate or strict, with 3 or 4 radiate branches terminating the peduncle 1–3 cm long, the cymules hemispherical, densely flowered. *Flowers* on short pedicels to 2 mm long; calyx and hypanthium very short, glabrous truncate the 4–5 teeth obtuse, ciliate; corolla funneliform, ca. 3 mm long, the lobes 4, rounded, glabrous outside, villose within; stamens 4, exserted, the anthers narrowly ovoid, to 0.7 mm long, the ovarian disc annular ca. 0.7 mm long, 0.65 mm wide, 0.8 mm tall; style ca. 2.5 mm long, the stigmas broader than long. *Fruits* capsular, obovoid or turbinate, ca. 2 mm long, 1 mm wide or almost as wide as long, the valves separating almost to the base, the inner face subplane, scarious, longitudinally grooved, the outer face weakly ribbed; seeds usually 4, plane, subrotund. 0.5–1 mm in diam. the wing enveloping the central glandular shiny fruit body.

The species is known only from Panama and Costa Rica. *Croat 11244*, taken from a fallen tree, has the inflorescences with galls measuring 5 × 4 mm in diameter. "Yema de Huevo."

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 3, 120* (F). Daytonia Farm, *Cooper 401* (F, US). PANAMÁ: Barro Colorado Island, *Croat 11244* (MO). VERAGUAS: Valley of Río Dos Bocas, road between Escuela Agricola Alto Piedra & Calovébora, 15.6 m NW of Santa Fé, *Croat 27755* (MO).

17. CHIOCOCCA

Chiococca P. Br., Civ. Nat. Hist. Jam. 164. 1756. TYPE: *Lonicera alba* L. = *C. alba* (L.) Hitchc.

Chiococca L., Syst. Nat., ed. 10. 917. 1789. TYPE: *C. racemosa* L.

Shrubs, *vines*, or *trees*, often scandent. *Leaves* membranous to coriaceous, petiolate; stipules usually cuspidate, persistent. *Inflorescences* axillary, racemose or paniculate, the racemes often secund. *Flowers* pedicellate; hypanthium compressed; calycine cup 5-lobed, persistent; corolla funnelform or campanulate,

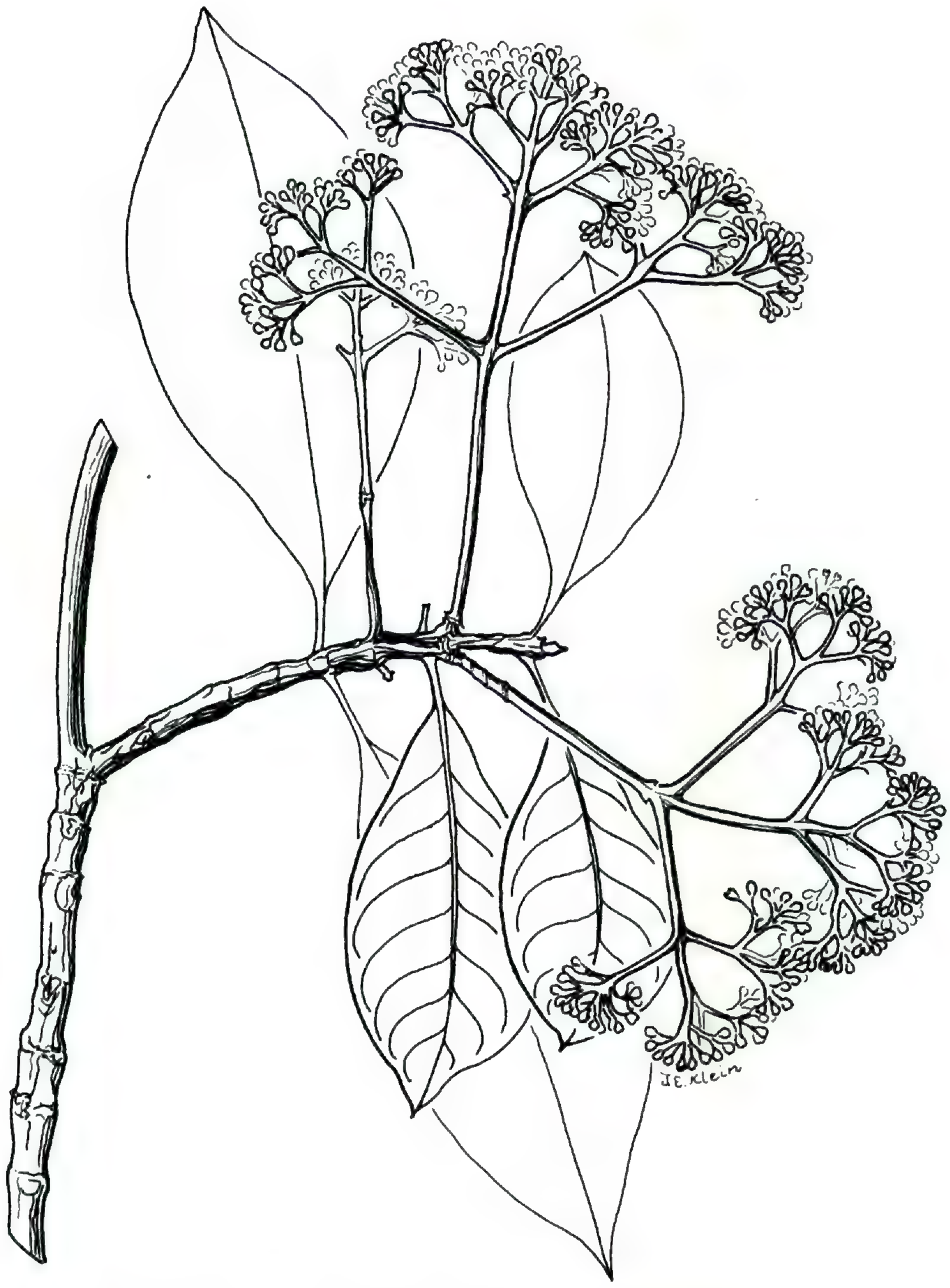

FIGURE 18. *Chimarrhis parviflora* Standley. Habit (×1). [After *Croat 11244*.]

glabrous throughout, the lobes valvate; stamens with the filaments connate at the base; ovary 2-celled, each cell 1-ovulate. *Fruits* drupaceous, orbicular, usually laterally compressed, white at maturity.

Chiococca occurs in southern Florida, tropical America, and the West Indies.

a. Vines or sprawling shrubs; stamen filaments included in the corolla tube.
   b. Corolla 3–4 mm long; leaves stiffly papyraceous to subcoriaceous, the lateral veins 4–5 ..... 1. *C. alba*
   bb. Corolla 6–10 mm long; leaves coriaceous, the lateral veins 5–8 ..... 2. *C. durifolia*
aa. Upright shrubs or trees; stamen filaments exserted.
   c. Leaves tapering at apex; corolla with tube 3.6–6.0 mm long ..... 4. *C. phanaestemon*
   cc. Leaves obtuse or subrotund at apex; corolla with tube ca. 2 mm long ..... 3. *C. jefensis*

1. **Chiococca alba** (L.) Hitchc., Ann. Rep. Missouri Bot. Gard. 4: 94. 1893.

Lonicera alba L., Sp. Pl. 175. 1753. TYPE: not seen.
Chioccoca racemosa L., Syst. Nat. ed. 10. 917. 1759. TYPE: not seen.
C. macrocarpa Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11(1): 231. 1844. TYPE: not seen.
C. petensis Lundell, Wrightia 5: 7. 1972. TYPE: Guatemala, *Contreras 2439* (LL).
C. vestita Lundell, Wrightia 5: 8. 1972. TYPE: Belize, *Lundell 16425* (LL).
C. vestita var. *glaberrima* Lundell, Wrightia 5: 9. 1972. TYPE: not seen.

Vines or *shrubs* (trees?), the twiglets smooth, glabrous, usually ultimately wiry, the branchlets perpendicular, opposite. *Leaves* ovate oblong, oblong, rarely rotund, 2.2–13.5 cm long, 1.3–6.0 cm wide, tapering acutely, obtuse or somewhat rounded toward the apex, often acuminate, the acumen often arising from a contracted apex, 1.0–1.5 cm long, acute or obtuse, often falcate, basally acute, attenuate acute, obtuse or rounded, the costa slender, prominulous above and beneath, the lateral veins 4–5, arcuate, uniting to form a submarginal vein 4–5 mm from the margin in the larger blades, the intervenal areas smooth, the fine endings of the venules regularly evanescent, stiffly papyraceous to subcoriaceous, usually glossy above, glabrous; petioles to 0.8 cm long, glabrous; stipules often persistent, widely triangular to oblong, 1.5–5.0 mm long, acute or contracted at the apex into a median subulate awn, to 4 times the length of the body. *Inflorescences* axillary, solitary, or often 2 per node, 2.5–8.0 cm long, racemiform or paniculate, the flowers occasionally solitary or in sessile cymules; peduncles slender, 0.7–7.0 cm long, ca. 0.35 mm wide, glabrous, the lowermost branches to 4.5 cm long. *Flowers* pedicellate, the pedicels 2–5 mm long; hypanthium subrotund, somewhat compressed, glabrous, the calycine cup ca. 1 mm long, the teeth acute, 5, about as long as the carnose, glabrous, eglandular cup; corolla white or yellow, urn shaped, 3–4 mm long, glabrous inside and out, petaloid, the lobes 5, oblong, slightly shorter than the tube, tapering obtusely; stamens 5, the anthers at first linear, then narrowly oblong, ca. 4 mm long at anthesis, the filaments slender, 1.2 mm long, pubescent, at the very base connate into a ring adnate to the corolla tube; style linear, 5–6 mm long, the stigmatic area turgid, to 1.3 mm long, the 2 lobes obtuse. *Fruits* white, fleshy, compressed, 4–8 mm in diam., the persistent calyx short.

Chiococca alba ranges from southern Texas through Central America south to Argentina. It also occurs in the West Indies. "Lagrimas de Maria."

BOCAS DEL TORO: Bocas, Maccaw Hills, *Wedel 553* (MO). Water Valley, *Wedel 1408, 1732, 1787* (all MO). CANAL ZONE: Fort Sherman, *Croat 14154, 15425* (both MO). Madden Forest, *Croat 15266* (MO). Fort Kobbe, *Duke 4207, 4716* (both MO). Albrook, *Dwyer 6707* (MO). Madden Dam, *Dwyer & Elias 7492* (GH, MO, UC, US); *Ebinger* 1960 (MO); *Kirkbride 55* (MO). Farfan Beach Road, *Kirkbride & Elias 65* (MO). Río Petitpie, road to Ft. Sherman from Gatún Locks (S2 or 82), *Mori & Kallunki 2693* (MO). Cocolí, *Tyson 1627* (MO). Fort Sherman, *Tyson & Blum 3750* (MO). Curundú, *Tyson & Dwyer 4466* (MO). Fort Kobbe, *Woodson et al. 1415* (MO). Salamanca Hydrographic Station, Río Pequeni, *Woodson et al. 1594* (MO). CHIRIQUÍ: Boquete, *Davidson 782* (MO). COCLÉ: El Valle, *Woodson et al. 741, 1253, 1760* (all MO). COLÓN: Portobelo, *D'Arcy 4011* (MO). 4 km E of Buena Vista, *Nee 6796* (MO). Achiote, *Tyson et al. 4538* (MO). DARIÉN: Pucro to Río Pucro, *Duke 5369* (MO). Piñas, *Duke 10586, 10600, 10639* (all MO). Chepigana, *Duke & Bristan 8* [#278 ?] (MO). HERRERA: Las Minas and Pesé, *Burch et al. 1322* (GH, K, MO, NY, UC, US). 12.5 mi S of Ocú, *Lewis et al. 1635* (GH, MO, UC, US). LOS SANTOS: Loma Prieta, *Duke 11886* (MO). Los Asientos, *Wendehake 35* (MO). PANAMÁ: Nuevo Emperador, *Baker 22* (MO). Cerro Campana, *Bartlett & Lasser 16908* (MO). Caldzada Larga, *Croat 12392* (MO). Chamé, *Dodge 16731* (MO). Río Cañita, *Duke 3841* (MO). Río Mamoní, *Duke 5681* (MO). Cerro Campana, *Duke 8668* (MO). Isla del Rey,

Duke 10422 (MO). Coronado Beach, *Duke 11814* (MO). San José Island, *Duke 12517* (MO). Cerro Azul, *Dwyer 1509* (MO). Cerro Campana, *Dwyer & Kirkbride 7823* (GH, MO). Cerro Azul, *Ebinger 1960* (MO). Cerro Campana, *Ebinger 1960* (MO). Chagres, *Fendler 138* (MO). Panamá Vieja, *Maurice 797* (MO). Playa de Venado, *Mejia 3* (MO). Old Fort Lorenzo, *Tyson 1585* (MO). El Llano, *Tyson 1742-A* (MO). Cerro Azul, *Tyson 2093* (MO). Playa Grande, San José Island, *Tyson & Loftin 5088* (MO). Arraíjan, *Woodson et al. 1404* (MO). VERAGUAS: Río Los Chorros, San Francisco, *Dwyer 1354* (MO). Near Ponuga, *Dwyer & Kirkbride 7439* (GH, MO, UC, US). Soná, *Woodson et al. 545* (MO). SAN BLAS: Soskatupu, *Duke 8967* (MO); *Elias 1693* (GH, MO, US).

2. **Chiococca durifolia** Dwyer.[20] TYPE: Panamá, *Dwyer 11865* (MO, holotype).

Vines or climbing *shrubs*, the terminal branchlets opposite, perpendicular, nigrescent, smooth, glabrous, the nodes well spaced, turgid (persistent leaf bases). *Leaves* oblong, ovate oblong, lanceolate, 3–13 cm long, 1.3–6.0 cm wide, deltoid obtuse or rounded at the apex, often with an acumen to 1.2 cm long, basally rounded, obtuse or cuneate, the costa plane or prominulous, often distally evanescent above, scarcely evident beneath, the lateral veins 4–5(–8), at first strict, then strongly arcuate, the submarginal vein well set in from the margin, coriaceous, smooth, glabrous, usually drying chocolate brown above; petioles to 2 cm long; stipules connate, compressed hemispherical, annular in appearance, ca. 2.5 mm long, much wider than long, apiculate, subcoriaceous, shiny, glabrous. *Inflorescences* axillary, to 8 cm long, often secund, glabrous or glabrate, racemiform or scarcely paniculate; peduncle absent or much reduced, to 1 cm long, the branches opposite, few; flowers solitary or in pairs; bracteoles minute, ovate subulate; pedicels to 0.6 cm long or obsolete. *Flowers* with the hypanthium rotund to subrotund, to 1.5 mm long, glabrate, drying black, the calycine cup scarcely developed, the teeth 5, erect, subulate, ca. 1.2 mm long, acute, puberulent; corolla white, the tube subcampanulate, 6–10 mm long, thickly petaloid, glabrous outside, puberulent ca. 2 mm above the base, the lobes 5, deltoid, scarcely shorter than the tube, acute; stamens 5, the anthers linear, 4–5 mm long, obtuse, the filaments slender, ca. 2 mm long, pubescent, connate at the base for ca. 0.5 mm; style slender for almost half its length, expanding above, the stigmas 2, somewhat unequal, oblong, ca. 1 mm long, the ovules oblong, ca. 1 mm long, obtuse. *Fruits* pedicellate, the pedicels shorter than the berry, white, rotund to oblong, strongly compressed laterally, to 0.8(–10) cm in diam., rounded or obtuse at the base, smooth, glabrous, delicately ribbed and venose, the persistent calyx coroniform, ca. 0.5 mm long.

Chiococca durifolia is known only from Panama and Colombia. The relatively abundant material cited has been misidentified as *C. pachyphylla* Wernham. The well-defined calycine teeth and the flattened fruit distinguish it from this species, whose calycine teeth are almost obsolete and whose fruit is nearly globose in cross section.

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[20] *Chiococca durifolia* Dwyer, spec. nov. *Vites* vel frutices scandentes. *Folia* oblonga ovato-oblonga vel lanceolata, 3–13 cm longa, 1.3–6 cm lata, venis lateralibus 5–8 supra evanescentibus, coriacea laevia glabra; petiolis ad 2 cm longis; stipulis compresso-rotundis, ad 2.5 mm longis. *Inflorescentiae* pedunculo nullo vel multo reducto. *Flores* dentibus calycis subulatis, ca. 1.2 mm longis; corolla alba tubo subcampanulato, 6–10 mm longo. *Fructus* pedicellis valde compressis, rotundi, ad 0.8(–10) cm diam., plani.

COCLÉ: La Mesa above El Valle, *Dwyer 11865* (MO). El Petrosa, 7 km N of El Copé, Alto Calvario, 900 m, *Folsom 1330* (MO). COLÓN: Santa Rita Ridge, *Correa & Dressler 906* (MO); *Dwyer et al. 9008* (MO); *Gentry 1422* (MO). PANAMÁ: Cerro Jefe, *Correa & Dressler 467* (MO); *Croat 15235* (MO). Cerro Azul, *Dwyer 1886* (MO). Cerro Jefe, *Elias & Hayden 1799* (GH, MO). Panamerican Highway to Cerro Jefe summit; 21.7 km from Panamerican Highway, *Folsom 3854* (MO). Cerro Jefe, *Kirkbride & Crebbs 9* (MO). Cerro Trinidad, SE slope, *Kirkbride & Duke 1649* (MO). Cerro Azul, *Tyson 2088* (MO). Cerro Jefe, *Tyson et al. 3207* (MO). COLOMBIA: CHOCO: Bahia Solano, *Gentry & Fallen 17164* (MO).

3. **Chiococca jefensis** Dwyer.[21] TYPE: Panamá, *Dressler 3296* (MO, holotype).—FIG. 19.

Trees (?), the branchlets terete, glabrous, the bark cracking, the nodes moderately well spaced. *Leaves* widely oblong, 5.5–13.5 cm long, 2.5–7.0 cm wide, obtuse or subrotund at the apex, acuminate, the acumen short, widely triangular, to 0.8 cm long, acute at the apex and the base, the costa plane or prominulous above, prominent beneath, to 0.12 cm wide, the lateral veins 7–8, arcuate, the marginal vein undulate, 1–2 mm distant from the margin, the venules inconspicuous above, reticulate beneath, thin coriaceous, scarcely discolorous, farinose punctate above and beneath; petioles rigid, to 1.5 cm long, to 2.5 mm wide; stipules (one seen and this juvenile) connate, the sheath cylindrical, turgid, ca. 5 mm long, coriaceous, glabrous, with each part compressed rotund, ca. 1.5 mm long. *Inflorescences* terminal, paniculate, to 8 cm long, to 7 cm wide, glabrous or glabrate, shiny; peduncle absent or to 3 cm long, the branches few, spreading; bracts and bracteoles not seen; pedicels to 1 cm long, stiff, smooth, to 0.8 mm wide toward the apex. *Flowers* glabrous except for the corolla tube within; hypanthium short, the calycine cup cupuliform, to 2 mm long, to 3 mm wide, conspicuously truncate, subcoriaceous, the lobes absent; corolla white, the tube compressed cylindrical, ca. 2 mm long, rigidly carnose, the lobes 5, oblong, to 7 mm long, obtuse, conspicuously villose at the base within, otherwise glabrous; stamens 5, exserted, the anthers oblong, ca. 2 mm long, to 1.5 mm wide before anthesis, contorted after anthesis, subbasifixed, the filaments thick, 2–4 mm long, geniculate near the middle, conspicuously villose except near the bend, attached at the mouth; style thick, to 5 mm long, ca. 0.6 mm wide, the stigmas 2, oblong, 2.2–3.0 mm long, obtuse, each stigma longitudinally bilobate. *Fruits* rotund, to 1 cm in diam., plano compressed, smooth, glabrous, white, the persistent calyx to 1 mm long.

Chiococca jefensis is known only from Panama.

PANAMÁ: La Eneida, region of Cerro Jefe, *Dressler 3296* (MO). Cerro Jefe, on top near Antenna, ca. 3000 ft, *Folsom & Harp 1373* (MO).

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[21] *Chiococca jefensis* Dwyer, spec. nov. *Arbores* (?) ramulis glabris. *Folia* lato-oblonga, 5.5–13.5 cm longa, 2.5–7.0 cm lata, apice obtusa vel subrotunda acumine brevi lato-triangulari, ad 0.8 cm longo, venis lateralibus 7–8 tenui-coriacea supra farinoso-punctata; petiolis rigidis, ad 1.5 cm longis, ad 2.5 mm latis; stipulis connatis vagina turgido-cylindrica, ca. 5 mm longa, ca. 5 mm lata. *Inflorescentiae* terminales paniculatae, ad 8 cm longae, ad 7 cm latae, glabrae pedunculo nullo vel ad 3 cm longo. *Flores* pedicellis ad 1 cm longis; hypanthio brevi cupula calycis ad 2 mm longa, dentibus nullis; corolla tubo compresso-cylindrico, ca. 2 mm longo, lobis 5, ad 7 mm longis; staminibus 5, exsertis antheris oblongis, ca. 2 mm longis, filamentis crassis, 2–4 mm longis; stylo crasso, ad 5 mm longo, stigmatibus 2, 2.2–3.0 mm longis.

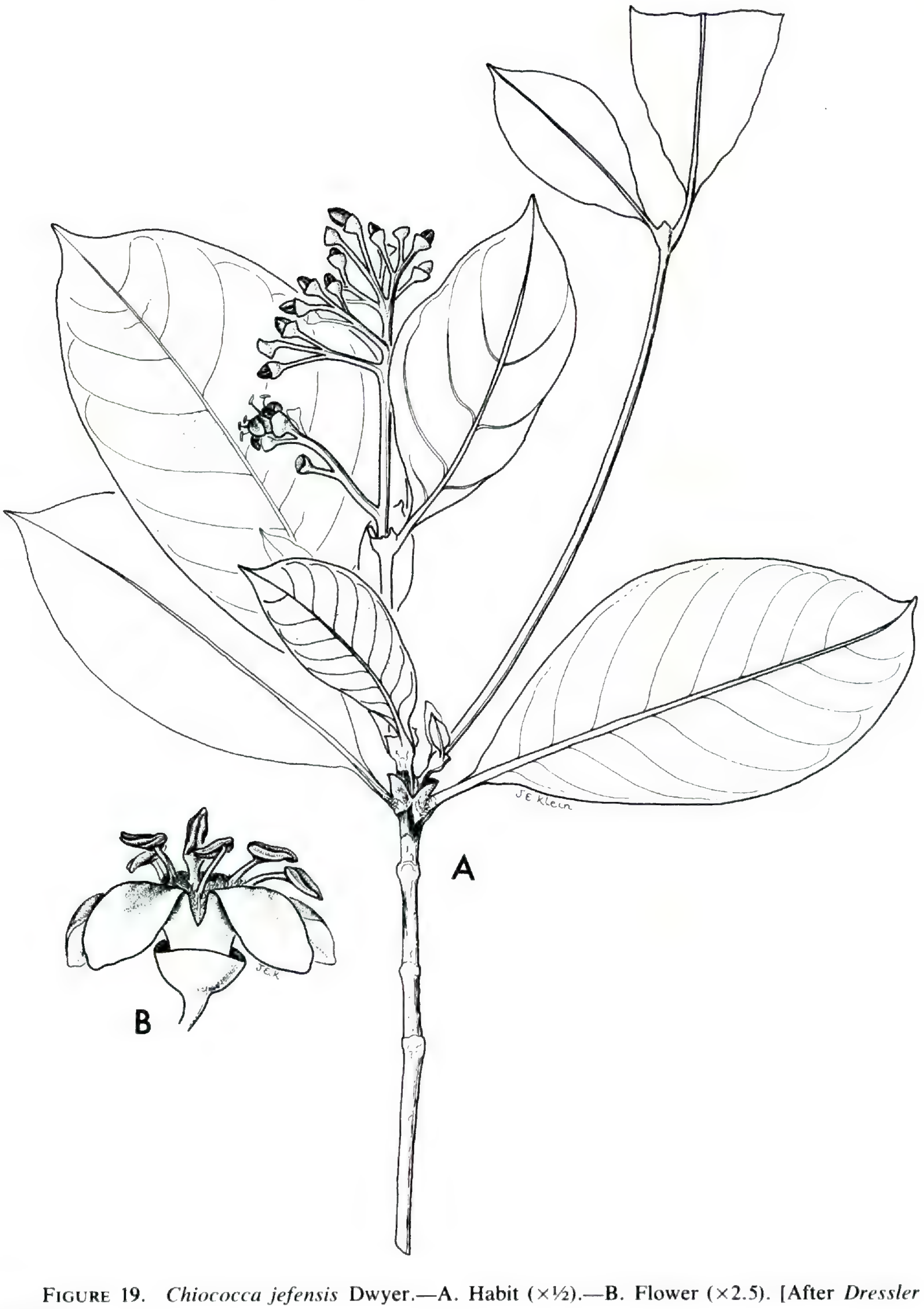

FIGURE 19. *Chiococca jefensis* Dwyer.—A. Habit (×½).—B. Flower (×2.5). [After *Dressler 3296*.]

4. **Chiococca phaenostemon** Schlecht., Linnaea 9: 594. 1834. TYPE: México, Schlechtendal, not seen.—FIG. 20.

C. staminea Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11: 231. 1844. TYPE: not seen.

Shrubs or trees, to 30 m tall, the twigs terete, smooth, glabrous, often nodose (persistent stipule bases). *Leaves* oblong or falcate lanceolate, 2.5–10.0 cm long, 0.7–3.3 cm wide, tapering to a narrow cusp, to 1.2 cm long, attenuate acute to cuneate at the base, usually slightly inequilateral, the costa plane or prominulous above, prominent beneath, the lateral veins ca. 8, often evanescent, delicately prominulous, at first strict, then arcuate and forking, the intervenal areas indistinct, subcoriaceous, lustrous, glabrous, delicately marginate; petioles to 2.5 cm long, ca. 0.12 cm wide; stipules connate, compressed hemispherical or widely deltoid, to 4 mm long, including the median subulate projection. *Inflorescences* terminal or axillary, when terminal about as long as the uppermost leaves and disposed as a spreading raceme or a narrow panicle, the peduncle 1.5–3.0 cm long, terminated by 3 or 4 primary branches, 2 or 3 of these longer, bearing short branches along their length or unbranched and with cymules. *Flowers* with the hypanthium oblong rotund, ca. 2.2 mm long, ca. 2.3 mm wide, smooth, glabrous, the calycine cup arising from a constricted base, ca. 0.8 mm long, glabrous, the lobes 5, oblong, ca. 1 mm long, convex in cross section, crassate, glabrous but puberulent marginally; corolla white or yellow, the tube campanulate, 3.6–6.0 mm long, constricted basally, thin carnose, glabrous, the lobes 5, subequal, ascending, deltoid, ca. 3 mm long, ca. 1.8 mm wide at the base, glabrous; stamens 5, the anthers linear, ca. 4.2 mm long, ca. 0.15 mm wide, the filaments slender, ca. 0.5 mm long, barbate, connate for ca. 0.35 mm, not attached to the corolla tube; ovarian disc doughnut shaped, 0.9–1.0 mm long, 0.5 mm wide, 0.6–0.75 mm high, the style linear subulate, 6.5–9.0 mm long, ca. 0.25 mm wide, narrower toward the base, the ovary bilocular, the ovules 2, oblong, ca. 1 mm long, pendent from the apex of the locule. *Fruits* on pedicels to 0.3 cm long, oblong rotund to rotund, to 0.5 cm in diam., the calyx persistent, smooth, glabrous, occasionally delicately ribbed or sulcate.

Chiococca phaenostemon occurs at elevations between 700 and 1800 m in Mexico, Guatemala, Honduras, Costa Rica, and Panama.

CHIRIQUÍ: Boquete, *Dwyer 6966* (MO). Bambito, 1300 m, *Maasola 31* (MO). Boquete, *Stern et al. 2016* (MO). Volcán de Chiriquí, *Terry 1359* (MO). Slopes below Cerro Horqueta, along Quebrada Horqueta, 1600 m, *Webster 16704* (MO). Valley of Upper Río Chiriquí Viejo, *White & White 37, 38* (both MO). Finca Lerida, *Woodson & Schery 224* (MO).

18. CHIONE

Chione DC., Prodr. 4: 461. 1830. TYPE: *C. glabra* DC.

Crusea A. Rich., Mém. Mus. Natl. Hist. Nat., Sér. B, Bot. 5: 204. 1834, non Schlecht. & Cham. 1830. TYPE: *C. glabra* (DC.) A. Rich.
Sacconia Endl., Gen. Pl. 451. 1838.

Trees or shrubs. *Leaves* often coriaceous, petiolate; stipules often briefly connate, small, caducous. *Inflorescences* terminal, cymose or corymbose, pedunculate; pedicels bracteolate. *Flowers* with hypanthium turbinate, the calycine

FIGURE 20. *Chiococca phaenostemon* Schlecht.—Habit (×½).—B. Flower, partly dissected (×5).—C. Ovary dissected (×5). [After *White & White 37*.]

cup with 5 lobes, or the margin simply undulate; corolla reduced, funnel shaped, lacking hairs within, the lobes 5, imbricate, 2 of these exterior; stamens 5, the anthers large, exserted, dorsifixed, the filaments stout, inserted above the base of the tube; ovarian disc swollen, the style stout, the stigmas oblong, exserted, the ovary 2-celled, the ovules solitary, pendulous. *Fruits* drupaceous, 2-celled; seeds elongate, the testa membranous.

Chione occurs in Central America and in the West Indies. There are about 15 species in the genus. It is the most poorly collected among the genera of the Rubiaceae of Panama containing several species.

a. Leaves with the lateral veins 4–9; petioles 0.5–1.5 cm long.
  b. Leaves with the lateral veins ca. 4, thickly coriaceous; fruits rotund ..... 1. *C. buxifolia*
  bb. Leaves with the lateral veins 5–9, papyraceous to coriaceous; fruits oblong or obovate oblong.
    c. Leaves with the lateral veins 5–6, the blades neither farinose punctate beneath nor barbate in the axils.
      d. Leaves with the largest blades to 3 cm wide; inflorescences with 2 branches; fruits ca. 2 cm long ..... 2. *C. campanensis*
      dd. Leaves with the largest blades ca. 7 cm wide; inflorescences with 3–5 branches; fruits ca. 1.4 cm long ..... 5. *C. panamensis*
    cc. Leaves with the lateral veins 7–9, the blades either farinose punctate beneath or barbate in the axils ..... 3. *C. costaricensis*
aa. Leaves with the lateral veins 13–15; petioles 1.8–3.5 cm long ..... 4. *C. darienensis*

1. **Chione buxifolia** Dwyer & Hayden, Phytologia 15: 55. 1967. TYPE: Panamá, *Tyson et al. 3291* (MO, holotype; NY, isotype).

Shrubs 3–5 m tall, glabrous, the branchlets terete, smooth, rimose. *Leaves* elliptic or oval elliptic, 2.0–6.5 cm long, 1.5–3.5 cm wide, deltoid or round obtuse at the apex, vaguely acuminate, the acumen obtuse, the costa plane above, prominulous beneath, the lateral veins ca. 4, strongly ascending, evanescent beneath when dry, depressed above, the marginal undulate vein well set in from the margin, the margin revolute, coriaceous, concolorous, drying deep brown, lustrous. *Flowers* not seen but presumably solitary (the fruits are solitary at the tips of the twigs). *Fruits* sessile or on pedicels to 0.5 cm long, rotund, to 1.5 cm long, 0.75 cm wide, black; the persistent lobes of the calyx minute, to 1 mm long; seeds solitary, large, hard, the endosperm biporous in cross section.

Chione buxifolia is known only from Panama.

PANAMÁ: Cerro Jefe, 6.5 km by road N of Goofy Lake, Cerro Azul, forest remnant on slope, *Nee 9308* (MO). La Chorrera, *Rodriguez 36* (MO). Cerro Jefe, 2700–3000 ft, *Tyson et al. 3291* (MO, NY).

2. **Chione campanensis** Dwyer.[22] TYPE: Panamá, *Wilbur et al. 1020* (MO, holotype).

Trees with the branches crowded, smooth, glabrous, the nodes well spaced. *Leaves* elliptic oblong, oblong, occasionally ovate oblong, 2.0–6.5 cm long, 1–3

[22] *Chione campanensis* Dwyer, spec. nov. *Arbores* ?. *Folia* elliptico-oblonga, oblonga vel ovato-oblonga, 2.6–5.0 cm longa, 1–3 cm lata, apicem versus lato-deltoidea, basi obtusa vel lato-cuneata venis lateralibus ca. 6, coriacea glabra; petiolis ad 1 cm longis; stipulis elliptico-oblongis, ad 4 mm longis, minuto-puberulis. *Inflorescentiae* patulae pedunculo 1.0–1.2 cm longo, ca. 0.1 cm lato, glabro ramis 2 angulari-ascendentibus fructibus paucis. *Fructus* pedicellis ad 0.8 cm longis, angusto-oblongi, ad 2 cm longi, ca. 0.7 cm lati, glabri.

cm wide, widely deltoid toward the apex, acuminate, the acumen widely triangular, to 3 mm long, obtuse, basally obtuse or widely cuneate, often inequilateral, the costa plane above or scarcely prominulous, prominulous beneath, the lateral veins ca. 6, prominulous beneath and conspicuous, strongly ascending, often branching dichotomously, the intervenal areas spreading reticulate, thin coriaceous, discolorous, dark red, glabrous; petioles to 1 cm long, ca. 0.1 cm wide; stipules elliptic oblong, to 4 mm long, acute, erect, stiff, minutely puberulent. *Inflorescences* spreading, the peduncle 1.0–1.2 cm long, ca. 0.1 cm wide, glabrous, the branches 2, angular ascending, the fruits few (flowers not seen). *Fruits* with pedicels ca. 0.8 cm long, carnose, narrowly oblong, to 2 cm long, ca. 0.7 cm wide, obtuse at the base, glabrous, shiny, the calycine cup persistent, to 1 mm long, the lobes absent, the margin undulate or with 5 inconspicuous, widely triangular lobes, to 0.2 mm long; disc of the ovary persistent, oblong or ovate oblong, to 5 mm long, truncate to obtuse at the apex.

Chione campanensis is known only from Panama. It is closely related to *C. buxifolia* Dwyer & Hayden whose leaves have few lateral veins and are more obtuse at the apex. The fruits of *C. campanensis* are narrowly oblong, while those of *C. buxifolia* are rotund.

PANAMÁ: Cerro Campana, trail to Campana Ridge, 2300 ft, *Wilbur et al. 1020* (MO).

3. **Chione costaricensis** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 111. 1940. TYPE: Costa Rica, *Austin Smith 1778* (F, holotype).

Chione allenii L. O. Williams, Phytologia 25: 462. 1973. TYPE: Costa Rica, *Allen 5321* (F, holotype).

Trees 6–7 m tall, the branchlets terete, smooth, glabrous, ultimately angular, the bark often flaking. *Leaves* elliptic ovate or lance oblong to oblong rotund, 6.5–14.5(–18) cm long, 3.5–7.0(–11.0) cm wide, acute, obtuse or rounded at the apex, acuminate, the acumen absent or when present widely deltoid, to 0.5 cm long, basally acute, rounded or obtuse, the costa slender, immersed or plane above, prominent beneath, the lateral veins 7–9, arcuate, prominulous beneath, the intervenal areas smooth, spreading reticulate, papyraceous, discolorous, glabrous or puberulent, barbate in the axils; petioles to 1.5 cm long, ca. 0.1 cm wide in the middle, glabrous; stipules deciduous (one seen), connate, the sheath ca. 1.5 mm long, with each part with an obtuse lobe, to 3 mm long, glabrous. *Inflorescences* terminal, solitary, glabrous, shorter than the terminal leaves, the peduncle 2.0–5.5 cm long, the branches opposite, the pairs few, angular ascending, the lowermost to 5 cm long; bracteoles minute, subulate. *Flowers* (fide Standley) with the corolla tube 5–6 mm long, ca. 0.4 cm wide, somewhat dilated near the mouth, the lobes 4, round elliptic, almost equal to the tube, glabrous within; stamens exserted, the anthers ca. 3.5 mm long, narrowly oblong. *Fruits* pedicellate for 1–4 mm, usually with 2 (or more?) often persistent bracteoles at the base, fusiform oblong, often falcately so, to 2.2 cm long, to 0.8 cm wide, delicately longitudinally striate, glabrous, capped by a calycine cup, to 1 mm long, the persistent annular disc protruding for 1 mm in penislike fashion.

Chione costaricensis is known from Costa Rica and Panama.

COLÓN: Salud, *Lao & Holdridge 233* (MO).

4. **Chione darienensis** Dwyer.[23] TYPE: Panamá, *Duke 13571* (MO, holotype).

Trees, the uppermost nodes crowded, the branchlets terete, ashen gray. *Leaves* oblong lanceolate or obovate lanceolate, 13–24 cm long, 4.5–7.8 cm wide, acute toward the apex, acuminate, the acumen to 1.3 cm long, subacute or cuneate toward the base, scarcely inequilateral at the base, the costa subplane above, prominent beneath, the lateral veins 13–15, prominulous beneath, the intervenal areas evanescent above, spreading reticulate beneath, papyraceous, shiny, glabrous above except for the costa and the veins, the hairs small, white, beneath sparsely appressed villose, barbate in the axils; petioles rigid, 1.8–3.5 cm long, often twisted; stipules not seen. *Inflorescences* (only one seen) axillary, to 13 cm long, ca. 11 cm wide, the peduncle slender, 4.5–6.0 cm long, arcuately disposed, terminated by 2 branches, these short and slender, to 1.5 cm long, appressed ciliate, with the scars of the pedicels ca. 6 per branch; bracts ovate, to 1.5 mm long, acute, concave, the margins ciliolate. *Fruits* falcate oblong or obovate oblong, to 2.2 cm long, attenuate toward the base, often minutely puberulent, the calycine cup to 1 mm long.

Chione darienensis is known only from Panama.

DARIÉN: Río Balsa, between Manené and Tusijuanda, *Duke 13571* (MO).

5. **Chione panamensis** Steyermark, Ceiba 3: 19. 1952. TYPE: Panamá, *Hagen & Hagen 2137* (NY, holotype; F, isotype).

Trees or shrubs, to 25 m tall, the branchlets numerous, terete, smooth, glabrous, the nodes well spaced, somewhat turgid. *Leaves* oblong or obovate-oblong, 3.5–9.5(–10.5) cm long, 2–7 cm wide, widely deltoid to obtuse at the apex, cuneate, obtuse, rounded or truncate at the base, the costa prominulous and grooved above, scarcely prominent beneath, the lateral veins 5–6, opposite, strongly ascending, often forking well below the margin, coriaceous, lustrous, mostly drying dark brown, the margin often revolute on drying; petioles to 1.5 cm long, rigid; stipules not seen. *Inflorescences* terminal, solitary, glabrous, cymose corymbose, 4.0–8.5 cm long, 3–7 cm wide, the peduncle 2.5–4.0 cm long, angular, usually terminated by 3–5 flabellately disposed branches or the branches opposite, few and well spaced, the lowermost to 3.5 cm long; bracts deciduous. *Flowers* with the hypanthium and calycine cup turbinate, ca. 3 mm long, coriaceous, glabrous, the cup eglandular within, the teeth not evident; corolla white, broadly cylindrical, ca. 4 mm long (in bud), wider than long, carnose, glabrous, the lobes 5, oblong rotund to compressed triangular, 3.3–4.0 mm long, often wider than long, obtuse or rounded at the apex, carnose, glabrous; stamens 5, the anthers widely oblong, ca. 3.5 mm long, the filaments ca. 3 mm long, thick; style subclavate, ca. 6 mm long, ca. 1 mm wide, the stigmas 2, oblong, ca. 1.5 mm

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[23] *Chione darienensis* Dwyer, spec. nov. *Arbores*. *Folia* oblongo-lanceolatae vel obovato-lanceolata, 13–24 cm longa, 4.5–7.8 cm lata, acumine ad 1.3 cm longo, venis lateralibus 13–15, papyracea nitida supra glabra praeter costam venasque; petiolis rigidis, 1.8–3.5 cm longis. *Inflorescentiae* axillares, ad 13 cm longae, ca. 11 cm latae, pedunculo gracili, 4.5–6.0 cm longo; bracteis ovatis, ad 1.5 mm longis. *Fructus* falcato-oblongi vel obovato-oblongi, ad 2.2 cm longi.

long, truncate. *Fruits* red, oblong, glabrous, to 1.4 cm long, marcescent, glandular shiny, glabrous.

Chione panamensis is known only from Panama.

CHIRIQUÍ: Cerro Horqueta, *Blum & Dwyer 2651* (MO); *Hagen & Hagen 2137* (F); *Kirkbride 158* (MO). PANAMÁ: El Llano-Cartí Road, 18 km from the Interamerican Highway, *Mori & Kallunki 5125* (MO). SAN BLAS: El Llano-Cartí Road, 24.5–25 km from the Interamerican Highway, *Mori & Kallunki 5533, 5557* (both MO).

19. CHOMELIA

Chomelia Jacq., Enum. Pl. Carib. 12. 1760. TYPE: *C. spinosa* Jacq.

Anisomeris Presl., Symb. Bot. Upsal. 2: 5. 1833. TYPE: *A. spinosa* C. B. Presl.

Shrubs or trees, occasionally armed, the branchlets occasionally reduced in length. *Leaves* with intervenal areas occasionally lineolate; stipules usually persistent. *Inflorescences* cymose, axillary, the peduncle occasionally reduced in length; bracts and bracteoles small, the latter occasionally connate. *Flowers* tubular, the teeth persistent; corolla white or cream colored, the corolla salverform or funnel shaped, usually sericeous outside, the lobes valvate or imbricate; stamens generally not exserted, the anthers dorsifixed, sessile, attached near the mouth; ovary 2-celled, each cell with a pendulous ovule. *Fruits* fleshy, the seeds cylindrical, pendulous.

Chomelia has over 400 species, about 50 of which occur in Central and South America. The genus has the majority of species in tropical Africa and tropical Asia. It also occurs in the Seychelles Islands.

There are only 4 genera among the Panamanian Rubiaceae which are armed. Apparently only one of these, *Uncaria*, is consistently armed. Most species of *Randia* have spines. In the case of *Machaonia* and *Chomelia* only rarely are the species with spines.

Literature:

Steyermark, J. S. 1967. *Chomelia* in Botany of the Guayana Highland. Mem. New York Bot. Gard. 17: 333–334.

a. Plants armed.
  b. Leaves with intervenal areas not lineolate ..... 9. *C. spinosa*
  bb. Leaves with intervenal areas lineolate ..... 1. *C. atlantica*
aa. Plants unarmed.
  c. Leaves with intervenal areas lineolate ..... 1. *C. atlantica*
  cc. Leaves with intervenal areas not lineolate.
    d. Sprawling shrubs; leaves with lateral veins ca. 6 ..... 7. *C. psilocarpa*
    dd. Trees or upright shrubs; leaves with lateral veins 6–13(–18).
      e. Leaves ashen white beneath; blades 7.0–18.5 cm long ..... 4. *C. leucophylla*
      ee. Leaves not ashen white beneath; blades 4.5–12.0 cm long.
        f. Flowers and fruits not secundly disposed.
          g. Inflorescence with peduncle scarcely measurable ..... 8. *C. recordii*
          gg. Inflorescence with peduncle 1–3 cm long.
            h. Leaves coriaceous; lateral veins 7–9.
              i. Leaves with petioles 0.5 cm long; stipules to 0.35 mm long ..... 3. *C. grandicarpa*

ii. Leaves with petioles to 1.5 cm long; stipules to 1 cm long ..... 2. *C. coclensis*
hh. Leaves chartaceous; lateral veins 6 ..... 6. *C. peninsularis*
ff. Flowers and fruits secundly disposed ..... 5. *C. panamensis*

1. **Chomelia atlantica** Dwyer.[24] TYPE: Panamá, *Kennedy & Gra 2242* (MO, holotype).

Trees or shrubs to 6 m tall, the branchlets short or long, to 13 cm long, the bark gray, densely appressed pubescent or glabrescent, the nodes well spaced, at times armed, the spines solitary, to 0.4 cm long, rigid. *Leaves* oblong, 3–14 cm long, 1.5–7.5 cm wide, deltoid toward the apex, acute, basally attenuate acute, rarely subcordate, sometimes inequilateral, the lateral veins 8–10, strongly arcuate, the intervenal areas conspicuously lineolate, chartaceous, discolorous, pubescent above on the costa and veins, with elongate appressed hairs on the costa and the veins beneath, the hairs of the intervenal areas small, strigose; petioles slender, to 2.2 cm long; stipules free, often deciduous, narrowly triangular, to 10 mm long, acute with a median keel, densely pubescent especially toward the base. *Inflorescences* axillary, perhaps pedunculate; flowers ca. 3; bracteoles connate at the base of the hypanthium, each part provided with a conspicuous bristle to 2.5 mm long. *Flowers* green or cream colored, the hypanthium oblong rotund, ca. 2 mm long, the hairs long, appressed, white, the calycine cup to 1.5 mm long, eglandular within, truncate, the lobes 4–5, subulate, to 6 mm long or longer, often curled; corolla with the tube 1.7–2.0 cm long, ca. 0.1 cm wide in the middle, with appressed, white and dense hairs outside, glabrous within, the lobes 4, narrowly ovate oblong, ca. 8 mm long, ca. 2 mm wide at the base, with a median keel, the latter with elongate, appressed hairs; stamens 4, somewhat included, the anthers narrowly oblong, 3.3 mm long, obtuse, the filaments ca. 0.5 mm long, attached near the mouth, the style linear, 4–11 mm long, the stigmas 2, ca. 1 mm long. *Fruits* not seen.

Chomelia atlantica is known only from Panama. It is immediately distinguished by the intervenal areas of the leaves being lineolate and the inflorescence being epedunculate. It is probably related to *C. tenuiflora* Bentham from Surinam, British Guiana, and Venezuela, which also has the bracteoles united below the hypanthium and a suppressed peduncle.

COLÓN: Swamp forest and bordering tierra firma, ca. 0.5 km from Río Buena-Ventura, near Portobelo, *Kennedy & Gra 2242* (MO). DARIÉN: Cerro Pirre, *Bristan 567* (MO). Caná-Cuasí trail (Camp 2), Chepigana, *Terry & Terry 1448* (F, MO).

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[24] *Chomelia atlantica* Dwyer, spec. nov. *Arbores* vel frutices ad 6 m alti, interdum armati. *Folia* oblonga, 3–14 cm longa, 1.5–7.5 cm lata, ad apicem deltoidea venis lateralibus 8–10 interveniis conspicue lineolatis subtus ciliis elongatis appressis in costa venisque praedita; petiolis ad 2.2 cm longis; stipulis ad 1 cm longis. *Inflorescentiae* fortasse epedunculatae floribus ca. 3 bracteolis connatis cupuliformibus basi hypanthii ad 1 mm longis, seta ad 2.5 mm longa. *Flores* cupula calycis ad 1.5 mm longa, truncata, dentibus 4–5 subulatis, ad 6 mm longis; corolla viridi vel cremea tubo ad 20 mm longo, lobis ca. 8 mm longis; antheris ca. 3.3 mm longis. *Fructus* non visi.

2. **Chomelia coclensis** Dwyer.[25] TYPE: Panamá, *Croat 25396* (MO, holotype).

Shrubs to 3 m tall, the branchlets terete, somewhat smooth, lightly puberulent, ascending at a sharp angle, the nodes well spaced, the lenticels many but inconspicuous. *Leaves* ovate-oblong or oblong, 4.5–10.5 cm long, 2–5 cm wide, deltoid or subobtuse at the apex, acuminate, the acumen triangular to 0.8 cm long, ultimately obtuse, obtuse or rounded at the base, the costa prominulous above, somewhat prominent beneath, the lateral veins ca. 7, arcuate, conspicuous beneath, the smaller veins not conspicuous, coriaceous, discolorous, dark brown and glabrous above, beneath with a few white hairs especially on the costa and the veins; petioles rigid, woody, to 1.5 cm long, to 1.5 mm wide; stipules deciduous, only seen at the apex of the twigs, rhombic oblong, to 1 cm long, 0.6 cm wide, acute, subcoriaceous, puberulent, the veins crowded, fanlike. *Inflorescences* subterminal, axillary, cymose paniculate, to 7 cm long, to 3 cm wide, the peduncle to 3 cm long. *Flowers* with the hypanthium oblong, glabrous, ca. 1 mm long, the calycine cup expanded, 0.1 mm long, the lobes 4, triangular, 0.1 mm long; corolla white, the tube cylindric funneliform, ca. 1.5 mm long, petaloid, glabrous without, densely white villose toward the mouth, the lobes 4, ovate, to 2.5 mm long, to 1.8 mm wide, ultimately obtuse; stamens 4, the anthers oblong, to 0.7 mm long, dorsifixed, the filaments scarcely longer than the anthers, attached near the mouth; stigmas 2, oblong, to 0.3 mm long, obtuse, the style ca. 2 mm long, the ovules one per locule, pendent. *Fruits* not seen.

Chomelia coclensis is known only from Panama. It is recognized by its coriaceous leaves and rigid, elongate peduncles. The flowers are much reduced in length.

COCLÉ: La Mesa above El Valle, 800 m, *Croat 25396* (MO).

3. **Chomelia grandicarpa** Dwyer.[26] TYPE: Panamá, *Kennedy & Foster 2174* (MO, holotype).

Trees to 6 m tall, the branchlets terete, glabrescent, smooth, moss covered. *Leaves* oblong, ovate-oblong or ovate, 4.5–11.0 cm long, 2.5–5.5 cm wide, deltoid to subacute at the apex, acuminate, the acumen to 1 cm long, ultimately acute,

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[25] *Chomelia coclensis* Dwyer, spec. nov. *Frutices* ad 3 m alti. *Folia* ovato-oblonga vel oblonga, 4.5–10.5 cm longa, 2–5 cm lata, versus apicem deltoidea vel subobtusa basi obtusa venis lateralibus ca. 7 coriacea; petiolis ad 1.5 cm longis; stipulis rhombico-oblongis, ad 1 cm longis. *Inflorescentiae* ad 7 cm longae, ad 3 cm latae, pedunculo rigido, ad 3 cm longo. *Flores* hypanthio glabro cupula calycis ca. 0.1 mm longa; corolla alba tubo ca. 1.5 mm longo, lobis 4 ad 2.5 mm longis; antheris ad 0.7 mm longis. *Fructus* non visi.

[26] *Chomelia grandicarpa* Dwyer, spec. nov. *Arbores* ad 6 m altae. *Folia* oblonga, ovato-oblonga vel ovata, 4.5–11.0 cm longa, 2.5–5.5 cm lata, venis lateralibus 6–8 venis venulisque minoribus non visis, rigido-papyracea ad tenui-coriacea, in costa subtus villosa; stipulis minutis triangularibus; petiolis ad 0.5 cm longis. *Inflorescentiae* axillares pedunculo forte gracile, ad 4.5 cm longo, floribus 2–5 in ramis 2 forte reductis dispositis. *Flores* sessiles cupula calycis carnosa extus appresso-villosa lobis 4 inconspicuis. *Fructus* oblongi, ad 3.2 cm longi, glabri rubri carnei, seminibus 2 oblongis, ad 2 cm longis, proxime apicem truncatis ad basin attenuatis conspicue rostratis in sicco purpureo-nigris laevibus inconspicue sulcatis.

rounded or obtuse at the base, the costa slender, prominulous above and beneath, drying red, the lateral veins 6–8, arcuate, forming an undulate, submarginal vein well in from the margin, the intervenal areas smooth, the smaller veins not visible, rigidly papyraceous to thin coriaceous, drying deep red brown above, lighter beneath, glabrous above and beneath but moderately villose on the costa below; petioles stiff, terete, to 0.5 cm long, glabrate; stipules persistent only at the tips of the twiglets, triangular, to 3.5 mm long. *Inflorescences* axillary, the peduncle slender, 1.2–4.5 cm long, ca. 0.15 mm wide, often curved, pubescent, terminated by 2 flowers or by 2 short, spreading branches, to 8 mm long, each branch with 2–5 flowers; bracts and bracteoles not seen. *Flowers* (in young bud) sessile, the hypanthium scarcely measurable, the calyx urn shaped, ca. 1 mm long, carnose, appressed pilose outside, the margin subtruncate with 4 compressed-rotund lobes, the latter scarcely measurable; corolla tube cream colored or pink and streaked, carnose, pubescent outside, the lobes valvate; ovules pendent, one in each of the 2 cells, the style cylindrical. *Fruits* presumably rotund when fresh, fleshy, red, when dried oblong, to 3.2 cm long, to 2.5 cm wide, the seeds 2, oblong, to 2 cm long, wider at the apex than at the base, truncate toward the apex, conspicuously rostrate, the beak triangular, to 0.4 cm long, obviously attenuate toward the base, drying purple black, smooth, glabrous, vaguely sulcate.

Chomelia grandicarpa is known only from Panama. The fruit is of extraordinary size for a *Chomelia*, and in the pressed condition appears like a young fruit of *Pterocarpus* (Leguminosae). This character, coupled with the few flowers per inflorescence and the subcoriaceous texture of the leaves, readily segregates the species from the remaining species in Panama. The fact that *Folsom 3696* has pink flowers that are streaked is noteworthy.

COLÓN: Santa Rita Lumber Road, 8.7 km from Transisthmian Highway, *Folsom 3696* (MO). 2–3 mi up Río Guanche, lowland rain forest, 10–20 m, *Kennedy & Foster 2174* (MO).

4. **Chomelia leucophylla** Dwyer.[27] TYPE: Panamá, *Gentry 4262* (MO, holotype).—FIG. 21.

Small *trees*, 4–10 m tall with the trunk branching above, the twigs terete, rigid, pubescent, the nodes well spaced. *Leaves* oblong elliptic, oblong or subrotund, sometimes falcate, 7.0–18.5 cm long, 2.2–11.0 cm wide, acute or deltoid at the apex, the acumen widely triangular, to 1 cm long, often falcate, at the base rotund or widely cuneate, the costa slender, prominulous above and beneath, the lateral veins 7–9, arcuate, thin chartaceous, discolorous, brown above, ashen white beneath, glabrous above except for the costa and veins, with the hairs beneath crowded, minute, white; petioles 0.5–2.3 cm long, to 0.13 cm wide; stipules free, narrowly lanceolate, 5–7 mm long, acute, the hairs curled. *Inflo-*

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[27] *Chomelia leucophylla* Dwyer, spec. nov. *Arbores* 4–10 m altae. *Folia* oblongo-elliptica, oblonga vel subrotunda, 7–18.5 cm longa, 2.2–11 cm lata, venis lateralibus 7–9 tenui-chartacea supra brunnea infra albo-cinerea; petiolis ad 2.3 cm longis; stipulis 5–7 mm longis, acutis. *Inflorescentiae* ad 3 cm longae, pedunculis 1–1.5 cm longis. *Flores* sessiles vel pedicellis ad 1.5 cm longis; cupula calycis brevi lobis 4 triangularibus subulatis vel foliaceis, 0.7–3 mm longis; corolla tubo ad 13 mm longo, lobis 2.5–3 mm longo; antheris ca. 2.2 mm longis. *Fructus* oblongi, ad 7 mm longi, puberuli.

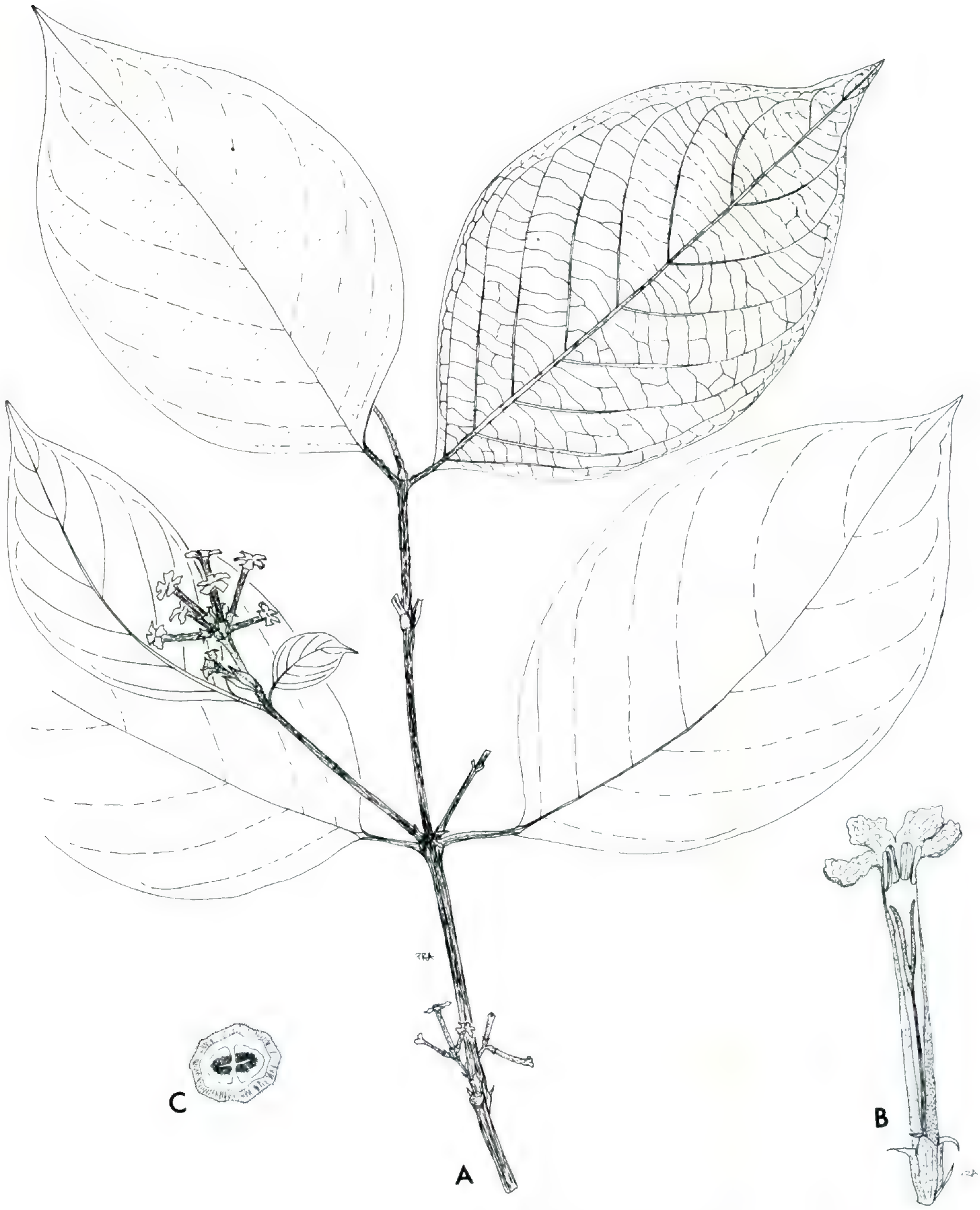

FIGURE 21. *Chomelia leucophylla* Dwyer.—A. Habit (×4.5).—B. Flower, opened to show interior (×2.8).—C. Ovary cross section (×7.5). [After *Holdridge 6452*.]

rescences axillary, to 3 cm long, the peduncles 1.0–1.5 cm long, slender, white puberulent, the flowers congested on short branches, the bracts and bracteoles small. *Flowers* sessile or subsessile, to 1.5 cm long, the hypanthium rotund, ca. 1.5 mm long, densely pubescent, the cup of the calyx short, provided with a few minute red glands within, the lobes 4, triangular, subulate or foliaceous, 0.7–3.0 mm long, acute, glabrous within, often reflexed; corolla with the tube narrowly

cylindrical, 10–13 mm long, 0.8 mm wide in the middle, puberulent outside, pubescent within near the base, the lobes 4, subrotund, 2.5–3.0 mm long, with the margins crisp, glabrous within; stamens 4, included within the tube, oblong, 2.2 mm long, obtuse, the filaments short, ca. 0.5 mm long, attached slightly below the mouth; style to 5.5 mm long, ca. 0.25 mm wide, the stigmas narrowly oblong, ca. 3 mm long. *Fruits* immature, sessile, oblong, to 7 mm long, to 3.5 mm wide, truncate above, tapering at the base, puberulent, drying brown, with 6 ribs.

Chomelia leucophylla is known only from Panama. It is readily recognized by the white undersurface of the leaf blades as suggested by the specific epithet.

COLÓN: Lower Río Guanche, *Dressler 4346* (MO). Río Trapiche, *Holdridge 6452* (MO). Río Guanche, ca. 3 km upriver from bridge, road to Portobelo, *Mori & Kallunki 5181* (MO). DARIÉN: Cerro Chucula, *Gentry 4262* (MO).

5. **Chomelia panamensis** (Standley) Dwyer, comb. nov.

Antirhea panamensis Standley, N. Amer. Fl. 32: 264. 1934. TYPE: Panamá, *Cooper 238* (F, holotype; NY, isotype).

Chione chambersii Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 138. 1967. TYPE: Panamá, *Stern & Chambers 144* (MO, holotype).

Trees of medium height, to 12 m tall, the bole slender, the crown small, the twigs smooth, the branchlets smooth, rimose, glabrescent, occasionally lenticellate, the leaves often persistent and verticillate at tips. *Leaves* ovate, oblong, elliptic oblong, occasionally oblong rotund, 6–13(–18) cm long, 3.0–6.5 cm wide, apically acute and acuminate or obtuse and abruptly acuminate, basally cuneate or obtuse, the lateral veins 7–8, usually immersed above, prominulous beneath, the intervenal areas often striate lineolate, stiffly membranous to rarely stiffly papyraceous, concolorous or not, glabrate or short pilose on the costa and the veins and often with short strigose appressed hairs in the intervenal areas; petioles slender, 1.0–2.5(–5.0) cm long; stipules deciduous, ovate elliptic, 4.0–5.5 mm long, attenuate at apex, glabrous to puberulent, ciliate marginally. *Inflorescences* terminal and/or axillary, cymose, shorter than or slightly longer than the uppermost leaves, the peduncles to 6 cm long, 0.4–0.8 mm wide, strigillose, twisted, the first 2 branches from apex of peduncle short and soon bifurcating to form branches to 3.5 cm long, often conspicuously spreading, the flowers several, secundly disposed, ca. 1 mm apart. *Flowers* sessile; hypanthium oblong, 1 mm long, glabrous to puberulent, the calycine cup and the 4–5 oblong-rotund lobes ca. 0.5 mm long, glabrous within, the lobes minutely ciliolate, carnose; corolla greenish yellow, the tube ca. 7.5 mm long, 0.6 mm wide at the middle, puberulent outside, glabrous within except hirsute at very base of the tube, carnose, the lobes 4, oblong rotund, 1.5 mm long, or 3 of 4 equal in width, compressed rotund to oblong, 1 mm long and the 4th oblong, 1.8 mm long, carnose, glabrous within; stamens 4, the anthers linear oblong, ca. 3 mm long, conspicuously sagittate at the base, subbasifixed, the filaments ca. 0.5 mm long, attached to the tube 2–3 mm below the mouth; ovarian disc hemispherical, ca. 0.3 mm long, the style linear, 6–8 mm long, the 2 stigmas narrowly oblong, slightly wider than the style, 0.7 mm long, the ovary thick walled, the ovules 1 per cell, pendulous, narrow oblong, ca. 0.7 mm long. *Fruits* sessile, fleshy, oblong, 1.0–1.3 cm long, rounded,

obtuse or truncate at the apex, smooth, glabrous, lightly costate, the ribs irregular and inconspicuous, black, and drying black; the calyx not persistent, the scar evanescent; seeds 2, enclosed by a very thick, hard endocarp.

Chomelia panamensis is known only from Panama and Colombia. The wood, bright orange in color, is used in interior construction, for axe handles, paddles, etc. The fruit, while juicy, is not eaten (fide Duke). "Tablis"; "Tapaliso"; "Tapalizo."

CHIRIQUÍ: Puerto Armuelles, *Stern & Chambers 144* (MO). DARIÉN: Río Ucurganti, *Bristan 1167* (MO). Río Yapé, *Bristan 1372* (MO). Without other locality, *Bristan & Duke 179* (MO). Santa Fé, Río Sabana, *Duke 4119* (MO). Río Chico across from Boca de Resca, *Duke 5220* (MO). Santa Fé, *Duke 8319* (MO). Río Balsa between Quebrada Chusomocatre and Río Aretí, *Duke 8709* (MO). N of Pucro, *Duke 13049* (MO). Río Sabana, above Santa Fé, *Duke 14098* (MO). Río Congo, *Holdridge 6290* (MO). Foothills, N slope of Cerro Pirre, *Mori & Kallunki 5412* (MO). Campamento Buena Vista, Río Chucunaque above Río Tuquesa, *Stern et al. 825* (MO). 3 mi N of Santa Fé, *Tyson et al. 4639* (MO). 3 mi E of Santa Fé, *Tyson et al. 4704* (MO). 2 mi E of Santa Fé. *Tyson et al. 4842* (MO). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11889* (MO). PANAMÁ: Between Cañasas and Sabalo, *Duke 14472* (MO). SAN BLAS: Permé, *G. P. Cooper 238* (F). COLOMBIA: CHOCO: 1 mi NE of Camp Curiche, 3 mi E of Curiche, *Duke & Idrobo 11320* (MO, NY).

6. **Chomelia peninsularis** Dwyer.[28] TYPE: Panamá, *Croat 22440* (MO, holotype).

Shrubs to 1.3 m tall, the branchlets numerous, terete, glabrous, the tips villose, densely lenticellate, the nodes well spaced. *Leaves* oblong to vaguely oblong rotund, occasionally ovate, 5.5–15.0 cm long, 2.8–8.0 cm wide, obtuse to deltoid at the apex, the acumen triangular, ca. 1 cm long, ultimately acute or obtuse, acute to cuneate at the base, the costa prominulous above and beneath, the lateral veins ca. 6, rigid and angular ascending for about ¾ of their length then curving arcuately to form an undulate vein to 1 cm from the margin, the smaller veins between the laterals scarcely visible, stiffly chartaceous, somewhat discolorous, drying dark green above, smooth, glabrate with a few hairs on the costa, often barbate in the vein axils beneath, the hairs dense-ferrugineous; petioles stiff, 0.3–0.8 cm long, ca. 1 mm wide in the middle, sparsely villose; stipules triangular, to 4 mm long, stiff, appressed pubescent. *Inflorescences* axillary or pseudo terminal, usually 2 per node, the peduncles wiry, 1.8–2.5 cm long, to 0.4 mm wide, glabrate, the peduncle ending as 2 spreading branches, the flowers 15 to 25 per inflorescence, disposed as a few secund cymules or solitary, sessile or subsessile. *Flowers* with the hypanthium oblong or turbinate, ca. 1.5 mm long, obtuse or rounded basally, the hairs few, the calycine cup scarcely measurable, the teeth usually 5, triangular or compressed rotund, to 0.3 mm long or inconspicuous; corolla white (in bud) to 6 mm long, densely white puberulent outside, carnose, barbate basally

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[28] *Chomelia peninsularis* Dwyer, spec. nov. *Frutices* ad 1.3 m alti ramulis crebris teretibus. *Folia* oblonga vel oblongo-rotunda interdum ovata, ad 15 cm longa, ad 8 cm lata, basi acuta vel cuneata, venis lateralibus ca. 6, vena submarginali undulata a margine bene distante, rigido-chartacea laevia solum in costa et venis sparse pubescentia axillis saepe barbatis; petiolis 0.3–0.8 cm longis, sparse villosis; stipulis triangularibus, ad 4 mm longis, appresso-pubescentibus. *Inflorescentiae* axillares vel pseudo-terminales, pedunculis gracilibus, 1.8–2.5 cm longis, glabrescentibus ramis duobus brevibus terminatis floribus 15–25 cymulis paucis vel floribus solitariis secunde dispositis, bracteis deciduis. *Flores* sessiles vel subsessiles, hypanthio ca. 1.5 mm longis, dentibus inconspicuis vel 5 et ad 0.5 mm longis, obtusis vel acutis. *Fructus* non visi.

within, the lobes valvate, to 2 mm long; stamens 5, the anthers oblong, ca. 1.3 mm long, obtuse, usually exserted, the filaments shorter than the anthers; style slender, ca. 7 mm long, the stigmas thumblike, ca. 2 mm long; ovules 1 per cell, pendulous. *Fruits* not seen.

Chomelia peninsularis is known only from lowland Chiriqui. It is readily distinguished from *C. panamensis* (Standley) Dwyer, a large tree which is distributed primarily in Darien Province and in the neighboring Province of Choco, Colombia. The new species is a shrub with thicker leaves and with fewer lateral veins.

CHIRIQUÍ: Burica Peninsula near Punta de Piedra, secondary forest, *Croat 22440* (MO).

7. **Chomelia psilocarpa** Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 139. 1967. TYPE: Panamá, *Hayden 143* (MO).

Scandent *shrubs*, often in treetops, the branches glabrous, smooth, often drying white. *Leaves* elliptic, 6.5–13.0 cm long, 2.5–6.0 cm wide, acute at the apex, acuminate, the acumen to 1 cm long, apiculate, the apiculum ca. 1 mm long, attenuate acute at the base, the costa prominulous beneath, the lateral veins ca. 6, alternate, strongly arcuate, papyraceous, glabrate above, the hairs short, white, deciduous, beneath ciliolate, the veins appressed pilose, with the shorter hairs seriately disposed, densely barbate in the axils of the veins; petioles 0.7–2.0 cm long, appressed subhirsute; stipules triangular or subulate, to 1 cm long, ca. 0.35 cm wide at the base, elongate acuminate, smooth, glabrate, diffusely pilose. *Inflorescences* axillary, cymose paniculate, to 9 cm long, ca. 6 cm wide, the peduncles 4–7 cm long, ca. 0.15 cm wide, stiff, ascending, 1–7 cm long, the cymules few flowered; bracts and bracteoles linear subulate, to 3 mm long, glabrate, the bracteoles of the pedicels several, aggregated at the end of the pedicel. *Flowers* not seen. *Fruits* sessile or pedicellate, the pedicels to 2 mm long, elliptic, ca. 1 cm long, to 0.6 cm wide, obtuse, the persistent lobes of the calyx 4, erect, linear subulate or linear ligulate, the 2 shorter 2–3 mm long, the 2 longer 5–6 mm long, the exocarp carnose, densely appressed pilose.

Chomelia psilocarpa is known only from the Canal Zone.

CANAL ZONE: BARRO COLORADO ISLAND: *Croat 7931, 10307* (both MO); *Hayden 143* (MO).

8. **Chomelia recordii** Standley, Trop. Woods 7: 9. 1926. TYPE: Guatemala, *Record 8862* (Y, holotype; NY, isotype).

C. englesingii Standley, Trop. Woods 16: 45. 1928. TYPE: Nicaragua, *Englesing 49* (F, holotype).
Anisomeris recordii (Standley) Standley, N. Am. Fl. 32: 227. 1934.
A. englesingii (Standley) Standley, N. Am. Fl. 32: 227. 1934.

a. Calyx with lobes lanceolate, villose outside ..... 8a. *C. recordii* var. *recordii*
aa. Calyx with the lobes narrowly subulate, glabrous outside ..... 8b. *C. recordii* var. *paucipubescens*

8a. **Chomelia recordii** Standley var. **recordii**.

Trees or shrubs, rarely armed, the spines lignose, to 1 cm long, the branchlets distichous, often short, terete, smooth, drying grey, glabrous or ultimately pu-

bescent. *Leaves* oblong, ovate oblong, occasionally oblong rotund or subfalcate, usually 2 times as long as broad, 6–11(–12) cm long, 2.5–5.5 cm broad, tapering obtusely or rounded at the apex, occasionally deltoid, acuminate or only vaguely so, the acumen to 0.8 cm long, obtuse, basally cuneate to obtuse, occasionally rounded, the costa plane or prominulous above, the lateral veins 6–8, occasionally subimmersed above, arcuate, usually forking toward the margin, chartaceous, scattered villose above, occasionally densely white villose beneath, the hairs elongate, spreading, occasionally confined to the costa and the veins, the intervenal areas glabrous or pubescent, the hairs often tufted in the axils, the margins often sparsely hirsute; petioles to 0.5 cm long, densely villose; stipules free, ovate lanceolate, to 8 mm long, acute, densely villose. *Inflorescences* axillary, of 2–3 flowers on a scarcely measurable and densely bracteate peduncle terminating a short or rarely elongate branchlet to 8 cm long; bracts foliose, lanceolate, to 5 mm long, acute, venose, villose. *Flowers* sessile; hypanthium oblong, ca. 1 mm long, densely appressed white villose, the calycine cup ca. 2.5 mm long, petaloid, villose outside, glabrous within, the lobes 4, unequal, lanceolate, to 3.5 mm long, acute, each with a distinct median vein; corolla white, the tube narrow cylindrical, ca. 17 mm long, 0.5–0.8 mm wide, petaloid, glabrate or densely appressed villose outside with white hairs, to 1.3 mm long, glabrous within, the lobes 4, oblong, ca. 5 mm long, obtuse, petaloid, glabrous adaxially, villose to glabrate within, the margins revolute, short fimbriate; stamens 4, the anthers sessile, narrowly oblong, ca. 2.8 mm long, attached ca. 2 mm below the mouth; style linear, ca. 17 mm long, the stigmas 2, narrowly oblong, ca. 1.5 mm long. *Fruits* oblong, ca. 8 mm long, ca. 3.5 mm wide, truncate, obtuse at the base, black or purple red, juicy, the hairs white, to 1.5 mm long, the calycine teeth ca. 5 mm long.

Chomelia recordii is known from Guatemala, Nicaragua, Costa Rica, Panama, and Colombia. "Pata de Gallina" (fide *Stern et al. 254*).

DARIÉN: Between Pinogana and Yaviza, *Allen 244* (MO). Río Ucurganti, *Bristan 1177* (MO). La Boca de Pirre, *Bristan 1281* (MO). El Río Aruza, *Bristan 1365* (MO). El Río Yapé, *Bristan 1407* (MO). Río Uruceca, *Bristan 1447* (MO). Without other locality, *Bristan 1509* (MO). Río Pirre, *Duke 4962A* (MO). Río Chucunaque near Quebrada Bolcillo, *Duke 8580* (MO). 2 mi N of Santa Fé, *Duke 10235, 10715* (both MO). 1–4 mi N of Pucro, *Duke 13031* (MO). Quebrada Maskia off Río Pucro, above Pucro, *Duke 13098* (F, MO). Between Cañasas and Sabalo, *Duke 14490* (MO). Trail from Paya to Payita, *Stern et al. 254* (MO). Campamento Buena Vista, Río Chucunaque above Río Tuquesa, *Stern et al. 865* (MO). 2–3 mi N of Santa Fé, *Tyson et al. 4626, 4833, 4843* (all MO). PANAMÁ: Bayano Cuipo forest, 28.5 km E of Bayano Bridge, *Folsom 3538* (MO). COLOMBIA: CHOCO: *Romero-Castañeda 6209* (COL).

8b. **Chomelia recordii** Standley var. **paucipubescens** Dwyer.[29] TYPE: Panama, *Gentry & Tyson 5038* (MO, holotype).

Shrubs, the branches short, often with reduced spines at the tips of the short branchlets. *Flowers* with the calycine lobes narrowly subulate, glabrescent outside.

Chomelia recordii var. *paucipubescens* Dwyer is known only from Panama.

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[29] *Chomelia recordii* Standley var. *paucipubescens* Dwyer, var. nov. *Frutices* ramulis brevibus saepe armati spinis brevibus terminalibus. *Flores* lobis calycis lineari-subulatis glabrescentibus; corolla tubo extus glabrescenti.

CANAL ZONE: Near archeological site, edge of Madden Lake, *Gentry & Tyson 5038* (MO).

9. **Chomelia spinosa** Jacq., Enum. Pl. Carib. 12. 1760. TYPE: Colombia, "in sylvaticis ad pedem montis de La Popa." *Jacquin*, not seen.—FIG. 22.

Ixora spinosa (Jacq.) Lam., Encycl. Méth. Bot. 3: 344. 1789.
Guettarda armata Bartl. in DC., Prodr. 4: 457. 1830. TYPE: not seen.
Chomelia filipes Benth. in Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn 1852: 41. 1852.
Caruelina filipes (Benth.) Kuntze, Rev. Gen. Pl. 277. 1891.
C. spinosa (Jacq.) Kuntze, Rev. Gen. Pl. 277. 1891.
Guettarda costaricensis K. Schum. nomen 1895. TYPE: not seen.
Anisomeris purpusii Brandegee, Univ. Calif. Publ. Bot. 6: 70. 1914. TYPE: México, *Pringle 6940* (UC, holotype).
Chomelia brachyloba Standley, Contr. U.S. Natl. Herb. 18: 136. 1916. TYPE: Panamá, *Pittier 4673* (US, holotype).
C. purpusii (Brandegee) Rusby, Bull. Torrey Bot. Club 52: 138. 1925.
C. longicaudata Rusby, Bull. Torrey Bot. Club 52: 139. 1925. TYPE: Colombia, *Smith 392* (US).
Anisomeris brachyloba (Standley) Rusby, Bull. Torrey Bot. Club 52: 142. 1925.

Trees to 20 ft tall or *shrubs*, the branchlets terete, smooth, the twiglets often rough with crowded nodes and withered stipular remnants, branched, the branches often uniformly as short as 3 cm, usually strict, the spines axillary, divergent, lignose, to 2 cm long, to 0.25 cm wide at base. *Leaves* often crowded at the end of twigs, oblong, ovate oblong, rarely ovate rotund, 3.7–14.0 cm long, 2.5–5.6 cm wide, acute, rarely obtuse, acuminate or cuspidate, acute at base, obtuse, often sharply contracted, occasionally truncate, often slightly inequilateral, the costa prominulous above, prominent beneath, densely or moderately villose beneath, the lateral veins 8–10, prominulous above and beneath, arcuate, the intervenal areas not lineolate; petioles to 2 cm long, to 0.5 mm wide, densely pubescent; stipules free, narrowly triangular, 4–6 mm long, tapering into an awn, scarious, pilose, often persistent. *Inflorescences* axillary, 1 per axil, 2–5 cm long, the peduncle capillaceous, ca. 0.4 cm long, strict, arcuate or occasionally deflexed, the cymules terminal, few flowered, the flowers erect, sessile, disposed like a candelabra. *Flowers* with the hypanthium rotund, 1.0–1.5 mm long, the calycine tube ca. 2 times the length of the hypanthium, the teeth 4, unequal, subulate, to 0.8 mm long, sericeous outside; corolla white, the tube cylindrical, to 18 mm long at maturity, to 0.65 mm wide at the middle, stiffly petaloid, the lobes 4, ovate lanceolate, to 6 mm long, conspicuously hooded at the narrow apex, sericeous outside, glabrous within, the margin scarious; stamens 4, the anthers linear oblong, ca. 3.5 mm long, obtuse, sagittate at the base, barely exserted, the filaments slender, very short, attached just below the mouth; ovarian disc about 0.6 mm long, the stigmas 2, linear oblong, ca. 1 mm long, the style ca. 17 mm long, slightly exserted, glabrous. *Fruits* sessile, oblong or ovate oblong, 0.5–0.9 cm long, obtuse or truncate at the apex, the persistent calyx ca. 1 mm long, drying black, pubescent, delicately ribbed.

This species extends from Mexico through Central America south to Colombia, Venezuela and northern Brazil. Lamarck's (1789) discussion of the species says that, "These flowers exhale during the night a very sweet odor." "Pata de Palome."

FIGURE 22. *Chomelia spinosa* Jacq. Habit (×½). [After *Allen 794*.]

CANAL ZONE: 1 mi NW of Paraiso, near Gaillard Cut, *Croat 12656* (MO). Summit Naval Radio Station, *Croat 12852* (MO). Old Gamboa road, Between Summit Hills Golf Course and Summit Naval Radio, *Croat 16668* (MO). Under Thatcher Bridge, *D'Arcy & D'Arcy 6082* (MO). Fort Kobbe, *Duke 3957* (MO). Albrook, U.S. Army Tropic Test Center, *Dwyer 6731* (MO). Cocolí, *Dwyer 7212* (MO). Madden Dam, Boy Scout Road, *Dwyer & Elias 7530* (GH, MO, US). Beach, Fort Kobbe, *Gentry 6428* (MO). Mandingo Road, *Hayden 60* (MO). Ancón Hill, *Holdridge 6536* (MO). K-2 Road, Contractors Hill, *Lewis et al. 2882* (COL, MO, UC, VEN). Fort Kobbe, *Luteyn 1088* (F). Gaillard Highway, Río Masambi Grande, *Nee 7069* (MO). Madden Road, 1–2 km N of Gaillard Highway Junction, 80–110 m, *Nee 7614* (MO). 1 mi NE of Fort Clayton, *Stimson 5192* (MO). Curundú, Survival School, *Tyson 1059* (MO). Chiva-Chiva Trail, Miraflores Lake, *Tyson 1362* (MO). Farfan Beach, *Tyson 1810* (MO). Rodman Ammo Dump, *Tyson 6658* (MO). Miraflores Lake, *White 128* (F, MO). Miraflores, *White 131* (F, MO). Ancón Hill, *Woodson et al. 1329* (F, MO). COCLÉ: El Valle, *Harvey 5188* (F). DARIÉN: Chepigana, *Duke & Bristan 265* (MO). HERRERA: Pesé, ca. 50 m, *Allen 794* (F, MO). Las Minas and Pesé, ca. 600 ft, *Duke 12337* (MO). 4 mi S of Los Pozos, *Tyson 2652* (MO). LOS SANTOS: Pocrí, *Dwyer 1195* (MO). PANAMÁ: Madden Lake, *Aguilera 16* (MO). Pacora, *Carrasquilla 190* (MO). Tocumen, *Dressler 3898* (MO). E of Bejuco, *Duke 4556* (MO). Between El Llano and Río Mamoní, *Duke 5530* (MO). Tocumen, *Dwyer* (MO); *Dwyer & Hayden 16* (MO). 8 mi S of Goofy Lake, *Dwyer 7125* (MO). 4 mi W of Chepo, *Gentry 5555* (MO). Taboga Island, *Gentry 5719* (MO). Archeological Site, Madden Lake, *Gentry & Tyson 5038* (MO). Chepo, *Pittier 4673* (US). VERAGUAS: Roadside savanna, 2–4 mi E of Santiago, 30 m, *Duke 12372 (MO)*. Santiago, 4 mi from Transisthmian Highway toward Atalaya, *Dwyer & Kirkbride 7411* (GH, MO, UC, US). 5 mi E of Santiago, *Tyson et al. 4274* (MO).

20. CINCHONA

Cinchona L., Sp. Pl. 172. 1753; Gen. Pl., ed. 5. 79. 1754. TYPE: *C. officinalis* L.

Quinquina Boehmer in Ludwig, Def. Gen. Pl. 30. 1760. New name for *Cinchona* L.
Kinkina Adans., Fam. 2: 147. 1763. Based on *Cinchona* L.
Cascarilla R. ex Steud., Nom., ed. 2: 1: 302. 1840; not Adanson 1763. Nomen nudum.

Trees or *shrubs*. *Leaves* petiolate; stipules interpetiolar, free, mostly deciduous, glandular at the base. *Inflorescences* terminal, paniculate, the branches mostly opposite. *Flowers* 5-merous, the hypanthium pubescent, the calycine cup turbinate, the lobes 5, mostly reduced; corolla variable in color, hippocrateriform, pubescent outside, glabrous within, the lobes valvate; stamens partly exserted or included, the anthers slender, dorsifixed; ovary 2-celled, the ovules numerous, imbricate, attached peltately to a spongy placenta, the style slender, the stigmas 2, obtuse; ovarian disc pulviniform. *Fruits* capsular, mostly ovoid oblong, septicidally dehiscent, opening from the base; seeds numerous, winged.

Cinchona is found in Costa Rica, Panama and in the Andes of South America. There are about 40 species in the genus.

1. **Cinchona pubescens** Vahl, Skr. Naturhist. Selsk. 1: 119. 1790. TYPE: not seen.—FIG. 23.

C. cordifolia Mutis ex Humb., Ges. Naturfe Feeund. Berlin Mag. Neuesten Entdeck. Gesammten May 1: Naturk. 117. 1807. TYPE: not seen.
C. pubescens α *cordata* DC., Prodr. 4: 353. 1830. TYPE: not seen.
C. tucuyensis Karst., Fl. Columb. 1: 17. pl. 9. 1858. TYPE: not seen.

Trees 5–8 m tall, the branchlets angular, glabrous, drying gray or reddish gray. *Leaves* oblong rotund to ovate rotund, to 30 cm long, to 20 cm wide, widely deltoid at the apex, obtuse to subrotund at the base, the costa slender, prominulous above and beneath, the lateral veins slender, 12–13, arcuate, the basal lateral veins often leaving the costa at right angles, the smaller veins pinnatiform, stiffly chartaceous, scarcely discolorous, drying red, glabrate above, appressed pilose on the costa and the lateral veins beneath; petioles to 8 cm long; stipules not seen. *Inflorescences* paniculate, to 35 cm long, the branches opposite, angular ascending, the lowermost to 15 cm long. *Flowers* not seen. *Fruits* pedicellate, the pedicels short, the capsules narrowly oblong or narrowly ovate oblong, to 3.5 cm long, to 0.7 cm wide, minutely golden puberulent, delicately longitudinally ribbed, the persistent calyx 1–2 mm long, wider than the apex of the capsule.

Cinchona pubescens occurs in Costa Rica, Panama and in the Andes of South America. The bark is the source of quinine. "Quina."

Steyermark (1974) gives an elaborate description of the flowers (from Spanish): "Calyx and hypanthium obconic or obconic oblong, 2.5–3.0 mm long, 2.0–2.5 mm wide, densely pale yellow sericeous. Calyx 1–2(–3) mm long, ca. 3 mm wide, moderately strigulose on the back, the teeth widely and slightly deltoid, acute to acuminate, much shorter than in *C. officinalis*, 0.2–1.0 mm long, strigulose on back. Corolla 15–16 mm long, the tube 10–13 mm long, minutely tomentose on the back, glabrous within; lobes lanceolate or oblong, obtuse or rounded at the apex, 3–5 mm long, 1.5–2.0 mm wide, tomentulose on the back,

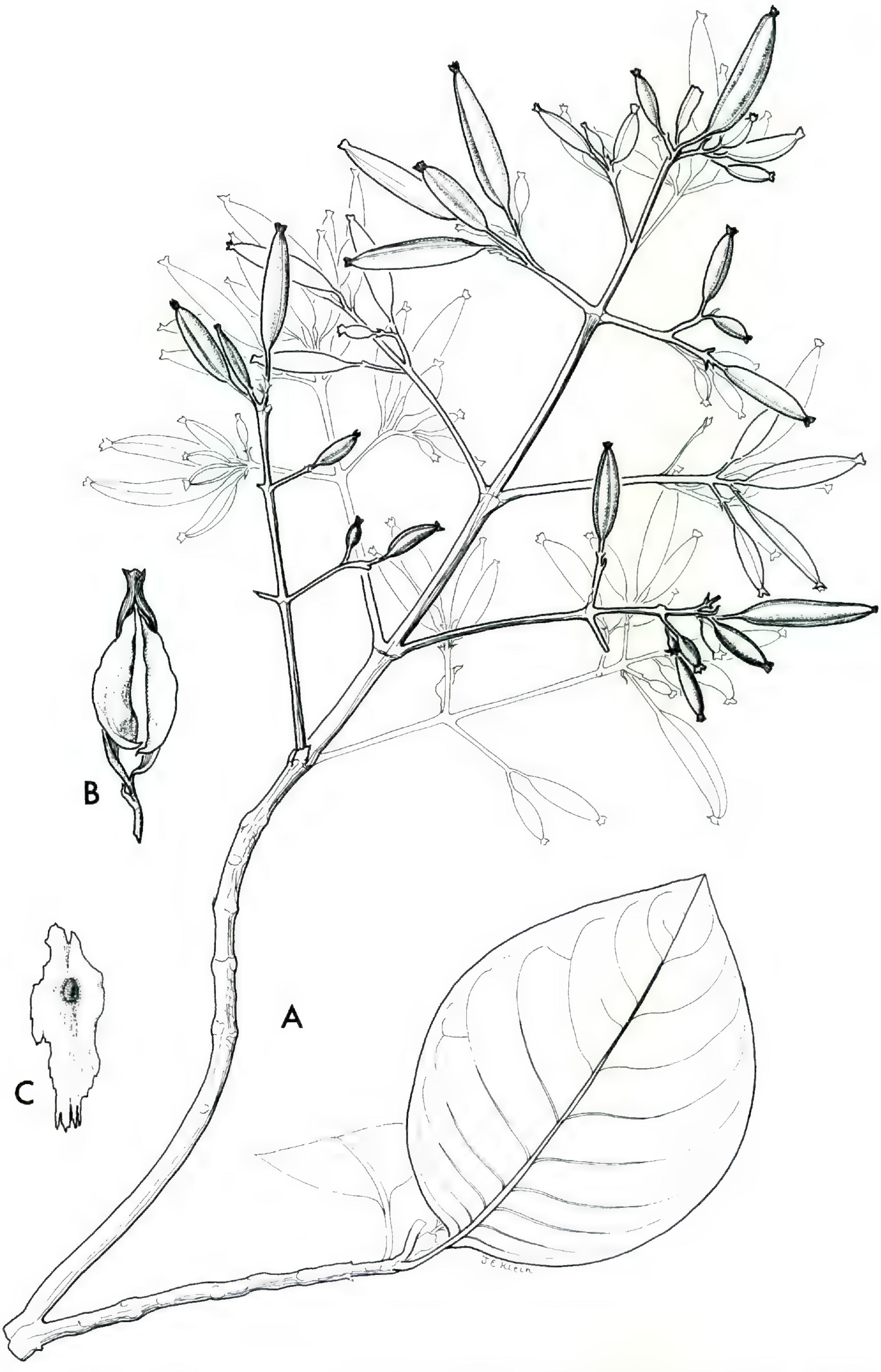

FIGURE 23. *Cinchona pubescens* Vahl.—A. Habit (×½). [After *Croat 15769.*]—B. Dehisced fruit (×1).—C. Seed (×5). [After *Fosberg 20016*, Colombia.]

densely villose along the margins within, otherwise glabrous. Anthers 2.5–3.0 mm long, the filaments ca. 2 mm long, attached approximately at the upper third; style 6–13 mm long, glabrous; disc scarcely puberulent to hispidulous."

CHIRIQUÍ: Disturbed cloud forest, Monte Rey above Boquete, *Croat 15769* (MO). Santa Clara region, 27 km NW of El Hato de Volcán, coffee finca Rattibor Hartmen called "Ojo de Agua," 5000–5300 ft, *Mori & Bolten 7410* (MO).

21. COCCOCYPSELUM

Coccocypselum P. Br., Civ. Nat. Hist. Jamaica. 144. 1756. "Coccocipsilum" Nomen and orthography cons. TYPE: *C. repens* Sw.

Sicelium P. Br., Civ. Nat. Hist. Jamaica. 144. 1756. Nomen Rejic. contra *Coccocypselum* P. Br. Based on *Coccocipsilum* P. Br.
Tontanea Aubl., Hist. Pl. Guiane 1: 108. 1775. TYPE: *T. guianensis* Aubl.
Bellardia Schreb., Gen. Pl. 1: 790. 1791, not Allioni 1785. Provisional name for *Tontanea* Aubl.
Condalia R. & P., Prodr. 11. 1794. Nomen Rejic., not *Condalia* Cav. (1799). Rhamnaceae. Nomen Cons. TYPE: *C. repens* R. & P.
Lipostoma D. Don in Edinburgh Philos. J. 1: 168. 1829. LECTOTYPE: *L. capitata* (Graham) D. Don (*Aeginetia capitata* Graham).

Herbs, often woody, prostrate or occasionally erect. *Leaves* petiolate; stipules free, persistent. *Inflorescences* terminal or axillary, the peduncle occasionally absent, the flowers disposed in a head; bracts and bracteoles small. *Flowers* 4-merous; calyx with the lobes narrow and elongate, persistent; corolla variable in color, infundibuliform, the mouth glabrous, the lobes valvate; stamens included or exserted, the anthers dorsifixed; ovary 2-celled, the ovules numerous in each locule, horizontal. *Fruits* baccate, ovoid or globose, shiny blue; seeds numerous, minute, somewhat angular.

Coccocypselum ranges from Mexico through Central America, the West Indies, and South America. There are about 20 species in the genus.

Literature:

Steyermark, J. S. 1967. *Coccocypselum* in Botany of the Guayana Highland. Mem. N.Y. Bot. Garden 17: 333–334.

a. Leaves with lateral veins 8–12, ovate lanceolate to oblong, to 7.5 cm long, often drying olive green; pubescence not reddish ..... 4. *C. lanceolatum*
aa. Leaves with lateral veins 6–8, mostly ovate, rhomboid or ovate rotund, to 6.5 cm long, not drying olive green, often with a reddish pubescence.
  b. Inflorescence with peduncles 1.0–3.8 cm long; leaves (2–)3–6.5 cm long, often with a reddish pubescence
    c. Leaves not cordate at the base ..... 3. *C. hirsutum*
    cc. Leaves cordate at the base ..... 1. *C. cordifolium*
  bb. Inflorescence sessile; leaves 0.8–4.2 cm long, lacking a reddish pubescence beneath ..... 2. *C. herbaceum*

1. **Coccocypselum cordifolium** Nees & Mart., Nova Acta Acad. Cas Leop.-Carol. German Nat. Cur. 12: 14. 1824.

Geophila pleuropoda Donnell Smith, Bot. Gaz. 52: 50. 1911. TYPE: Guatemala, *Goll s.n.*, not seen.
Geocardia pleuropoda (Donnell Smith) Standley, Contr. U.S. Natl. Herb. 17. 445. 1914.
Tontanea pleuropoda (Donnell Smith) Standley, N. Am. Fl. 32: 148. 1921.

Coccocypselum rothschuhii Loesner, Engler Bot. Jahrb. Syst. 60. 370. 1926. TYPE: not seen.
Coccocypselum pleuropodum (Donnell Smith) Standley, Publ. Field Colombian Mus., Bot. Ser. 4: 281. 1929.

Herbs, stems prostrate, the hairs dense, weak, spreading, the nodes well spaced. *Leaves* reniform, ovate or ovate rotund, 2.0–4.5 cm long, 1.5–3.2 cm wide, widely deltoid to obtuse at the apex, cordate at the base, the lateral veins 4–6, arcuate, usually drying purple beneath. *Inflorescences* with peduncle to 1.6 cm long.

Coccocypselum cordifolium ranges from Mexico to Panama; it also occurs in eastern and southern Brazil. I have seen only one collection from Panama. Standley & Williams' (1975) description reads, "Inflorescence mostly 2–4-flowered; bracts linear or foliaceous; calyx and hypanthium long-hirsute; calyx lobes linear or oblong linear, acute, 2–4 mm long; corolla 12 mm long, purplish white or sometimes blue; fruit densely hirsute, bright blue or sometimes greenish white."

2. **Coccocypselum herbaceum** P. Br., Civ. Nat. Hist. Jam. 144. 1756. TYPE: Jamaica, not seen.

C. repens Swartz, Prodr. Veg. Ind. Occ. 31. 1788. not *C. repens* H.B.K., 1819; not *Condalia repens* R. & P. (1798).
Tontanea herbacea (P. Br.) Standley, N. Am. Fl. 32: 147. 1921.

Prostrate *herbs*, the stems slender, glabrescent or pilose. *Leaves* ovate or ovate subrotund, 0.8–4.2 cm long, 0.5–2.5 cm wide, widely deltoid at the apex, rounded or truncate at the base, often slightly contracted at the junction with the petiole, often inequilateral, the costa prominulous above and beneath, the lateral veins 6–8, arcuate, membranous, glabrescent to pilose above, the hairs short or long, the latter often scraggly, golden, bulbous at the base, often much longer above than beneath, pilose beneath but the hairs often restricted to costa and veins and then appressed and elongate; petioles 0.5–2.5 cm long, ca. 0.1 cm wide; stipules small, 2.5–3.0 mm long, the awn often 5 times longer than the body. *Inflorescences* sessile or subsessile, the heads few flowered. *Flowers* with the calycine lobes subulate, to 4 mm long, pilose; corolla light blue, the tube to 9 mm long, short pilose. *Fruits* ovoid at maturity, subrotund to ovate rotund when immature, to 1.5 cm long, pilose, the hairs gradually deciduous, china blue.

Coccocypselum herbaceum is well distributed throughout tropical America and the West Indies. Steyermark (1967) discusses the synonomy of *C. herbaceum* at length.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al. 2730* (MO, PMA). Chiriqui Lagoon, *Wedel 1134* (MO). CANAL ZONE: N of El Cope, 9.4 km above El Cope, 750–900 m, *Croat 44632* (MO). Pipeline Road, *D'Arcy 9273* (MO). Chagres, *Fendler 179* (MO). Telephone cable trail between splice S16 and S49, Río Indío, *Steyermark & Allen 17433* (MO). CHIRIQUÍ: Cerro Colorado, 20–28 mi from San Félix, 1200–1500 m, *Croat 33374* (MO). COCLÉ: La Mesa above El Valle, *Dwyer 11904* (MO). La Mesa, *Folsom & Butcher 2837* (MO). El Valle, *Lewis et al. 2512* (COL, DUKE, K, MO, UC, VEN). COLÓN: Miguel de la Borda, *Croat 10028* (MO). Río Guanche near Coastal Highway, *D'Arcy 10192* (MO). Santa Rita Ridge, *Dwyer & Gentry 9360* (MO). HERRERA: 12.5 mi S of Ocú, 1200 ft, *Lewis et al. 1647* (MO). PANAMÁ: Alto de Pacora, *Busey 804* (MO). Cerro Jefe, *Croat 13059* (MO). Campo Tres beyond Cerro Jefe, *Croat 27088* (MO). Pipeline Road near Gamboa, *Clewell & Tyson 3218* (MO). Panamá Viejo, *Duke 5734* (MO). Cerro Azul, *Duke 9378* (MO). Cerro Campana, *Gentry 1853* (MO). Cerro Jefe, summit, ca. 3000 ft, *Hayden 1004* (MO). Cerro Azul, *Mori & Kallunki 2167* (MO). Cerro

Jefe, ca. 1000 m, *Mori & Kallunki 3618* (MO). Cerro Jefe, *Tyson et al. 3215* (MO), *4430* (SCZ). SAN BLAS: Road between Mandinga & Cangandí, *Duke 14745* (MO). VERAGUAS: Río Primero Braso, 2.5 km beyond Agriculture School near Santa Fé, 700–750 m, *Croat 25458* (MO). To 7 km NW of Santa Fé, *D'Arcy 10279* (MO). Mouth of Río Concepción, *Lewis et al. 2803* (MO, SCZ, UC).

3. **Coccocypselum hirsutum** Bartling ex DC., Prodr. 4: 396. 1830. TYPE: probably Trinidad, type collection not known.

Tontanea hirsuta (Bartl.) Standley, N. Am. Fl. 32: 147. 1921.
Coccocypselum hirsutum Bartling ex DC. var. *hirsutum*.

3a. **Coccocypselum hirsutum** DC. var. **hirsutum**.

Prostrate *herbs*, the nodes well spaced. *Leaves* ovate, ovate rhomboid, rarely oblong or reniform ovate, (2–)3.0–6.5 cm long, 1.5–5.0 cm wide, widely deltoid to obtuse at the apex, widely triangular to truncate at the base, usually slightly inequilateral, densely pubescent or with a few elongate hairs above, these golden and bulbous at the base, hirsute beneath, the hairs often elongate and stiff as well as short and soft, the hairs sometimes restricted to the margins of the blade; petioles to 2 cm long; stipules subulate, 3–6 mm long (Standley & Williams 1975). *Inflorescences* pedunculate, the peduncles 1–4 cm long, slender, glabrescent, often bearded. *Flowers* with the calycine lobes 4, linear lanceolate, 3–6 mm long, densely hirsute; corolla to 11 mm long. *Fruits* 2–4 per cluster, ovate, to 2 cm long, densely hairy or with a few hairs, often delicately lenticellate.

Coccocypselum hirsutum ranges from Mexico to Panama. It also occurs in Trinidad, Colombia, and Bolivia.

CANAL ZONE: Cerro Pelado, 1 km N of Gamboa, 200–220 m, *Nee 11024* (MO). CHIRIQUÍ: San Félix, Cerro Otoe, 3000 ft, *Bort 69* (MO). Road from Boquete to David, *Kirkbride 85* (MO). COLÓN: Río Piedras, road to Portobelo, *Blum et al. 2518* (MO, SCZ). María Chiquita, *Dwyer & Kirkbride 7796* (MO). Santa Rita Ridge, *Nee & Mori 3671* (MO). NE of Santa Rita Ridge, 650 m, *Wilbur & Weaver 10837* (MO). PANAMÁ: Goofy Lake, 200 ft, *Correa & Dressler 583, 584* (both MO). Cerro Jefe, *D'Arcy 9751* (MO). Cerro Azul, *D'Arcy & D'Arcy 6227* (MO). Hills NE Hacienda La Joya, *Dodge et al. 16896* (MO). Cerro Campana, summit, *Duke 6009* (MO). Cerro Azul, *Ebinger 421* (MO). Cerro Jefe, 2900 ft, *Elias & Hayden 1796* (MO). Cerro Azul, Finca Melo, *Kant 47* (MO). Cerro Jefe, *Kirkbride & Crebbs 28* (MO). Cerro Campana, *Kirkbride 245* (MO); *Lewis et al. 1927* (GH, MO, US), *1948* (MO), *3075* (COL, MO, UC, VEN); *Porter et al. 4175* (MO). Cerro Jefe, 2900 ft, *Porter et al. 5063* (COL, MO, UC). Cerro Campana, *Witherspoon & Witherspoon 8904* (MO).

3b. **Coccocypselum hirsutum** var. **glabrum** (DC.) L. O. Williams, Phytologia 25: 462. 1973.—FIG. 24.

C. glabrum Bartl. ex DC., Prodr. 4: 397. 1830. TYPE: not seen.
Tontanea glabra (DC.) Standley, J. Wash. Acad. Sci. 15: 104. 1925.

Prostrate *herbs*. *Leaves* ovate to oblong, 3–6 cm long, to 5 cm wide, widely triangular to truncate at the base, glabrate above and below. *Inflorescences* with the peduncles to 4 cm long, glabrous. *Fruits* ovate, to 2 cm long.

Coccocypselum hirsutum var. *glabrum* occurs in Mexico, Guatemala (Peten), Belize, Nicaragua, and Panama.

CHIRIQUÍ: Boquete, ca. 4000 ft, *Davidson 759* (MO). 4.1 mi from Boquete, road to David, *Kirkbride 85* (MO). COLÓN: Between Río Piedras and Puerto Pilón, *Lewis et al. 3227* (MO). Santa Rita

FIGURE 24. *Coccocypselum hirsutum* var. *glabrum* (DC.) L. O. Williams. Habit (×½). [After *Kirkbride & Crebbs 28.*]

Ridge, 2 mi E of Transisthmian Highway, *Lewis et al. 5242* (MO, SCZ, UC). Santa Rita Ridge Road, ca. 1.9 km from Boyd-Roosevelt Highway, *Mori & Kallunki 1808* (MO). PANAMÁ: Goofy Lake, *Correa & Dressler 584* (MO). Cerro Campana, savanna near top, *Duke 6009* (MO). Goofy Lake, 2000 ft, *Dwyer et al. 4137* (COL, DUKE, F, MEXU, MO, NY, MICH, PMA, VEN). Cerro Campana, ¾ way to summit, *Dwyer 4719* (MO). Cerro Azul, *Montenegro 65* (MO).

4. **Coccocypselum lanceolatum** (Ruiz & Pavón), Pers. Syn. Pl. 1: 132. 1805.

Condalia lanceolata Ruiz & Pavón, Fl. Peru. Chil. Prodr. 1: 54. 1798. TYPE: Peru, "in memoribus Cuchero and Chinchao, Ruiz & Pavon," not seen.
Coccocypselum canescens Willd. ex C. & S., Linnaea 4: 139. 1929. TYPE: "Herb. Willd. n. 2844 (specimen Humboldtianum)," not seen.
Tontanea canescens (Cham. & Schlect.) Standley, N. Amer. Fl. 32: 146. 1921.

Herbs, prostrate or to 25 cm tall, the stems golden green, pilose, the nodes well spaced. *Leaves* ovate lanceolate to oblong, often somewhat falcate, 2.0–7.5 cm long, 1–3 cm wide, deltoid, obtuse to occasionally rounded at the apex, basally

cuneate or obtuse, occasionally truncate, acute or obtuse, usually slightly inequilateral, the costa plane or grooved above, plane to prominulous beneath, the lateral veins 8–12, arcuate, chartaceous, densely pilose beneath and above, velvety to the touch, often drying olive green, the veins often bearded beneath; petioles 0.3–1.3(–3.5) cm long; stipules mostly persistent, ovate triangular, 5–6 mm long, the awn longer than the body, densely hairy. *Inflorescences* subsessile or on peduncles 2–3(–5) cm long, 0.1–0.3 cm wide, densely pilose. *Flowers* sessile, numerous; hypanthium subrotund, ca. 2 mm long, densely hairy, the calycine lobes 4, erect, ovate or oblong, 3(–6) mm long; corolla white, rarely purple, the tube 4–5 mm long, petaloid, pilose outside, glabrous within, the lobes 4, oblong or triangular, ca. 2 mm long; stamens 4, the anthers sessile, attached near the middle of the tube, ovate, ca. 1 mm long; style ca. 2 mm long, the stigmas slender, about the same length as the style. *Fruits* bright blue, ovoid, to 7 mm in diam., pilose.

Coccocypselum lanceolatum is well distributed throughout Middle America and extends into Brazil and Bolivia. The leaves of the Panamanian collections are smaller than those collected to the west of Panama.

CHIRIQUÍ: Boquete, 3800 ft, *Davidson 635, 756* (both F, MO). Boquete, Llanos Francia, *Dwyer & Hayden 7583* (F, GH, MO), *7602* (MO). Boquete, Road to David, *Kirkbride 84* (MO). Cerro Colorado, road 35.6 km from Río San Félix bridge, 1390 m, *Sullivan 379* (MO). Boquete, 1200–1500 m, *Woodson & Schery 793* (MO). COCLÉ: Between Las Margaritas and El Valle, *Woodson et al. 1275* (MO). DARIÉN: Gold mine, Caná, 500–600 m, *Croat 37646* (MO). HERRERA: Between Las Minas and Pese, *Burch et al. 1338* (MO). VERAGUAS: Trail between Cañazas and foot of Cordillera Central, Río Cañazas, *Allen 183* (MO). Near San José on Santiago-Santa Fé Road, 400 m, *Nee 8179* (MO).

22. COFFEA

Coffea L., Sp. Pl. 172. 1753; Gen. Pl. ed. 5: 80. 1754. TYPE: *C. arabica* L.

Shrubs, rarely pubescent. *Leaves* occasionally ternate, usually petiolate, the stipules free, acuminate, persistent. *Inflorescences* with flowers conglomerate in the axils, the bracteoles connate into a calyxlike cup. *Flowers* sessile or pedicellate, the hypanthium variously shaped; calycine cup reduced, truncate, dentate or lobulate, often bearing small glands within; corolla salverform or funnelform, the lobes 4–8, contorted; stamens 4–8, sessile or on short filaments inserted in the throat, the anthers linear, basally dorsifixed, exserted or included, often twisted; ovarian disc swollen, the style slender or thick, the stigmas 2, narrow, the ovary 2-celled, the ovules solitary, subpeltately affixed to the middle of the septum. *Fruits* baccate, dry or fleshy, the 2 carpels often coriaceous, convex but plane and sulcate on the inner face; seeds 2, convex, the testa membranous with a deep groove on the ventral side.

This is a genus of about 40 species represented in the tropics of the Old World, especially in Africa. The 2 species, *Coffea arabica* and *C. liberica*, supply most of the coffee of commerce.

Literature:

Standley, P. C. & L. O. Williams. 1975. *Coffea* Linnaeus Coffee (part of Rubiaceae of Guatemala). Fieldiana 24, part II: 44.

a. Flowers 5-merous ..... 1. *C. arabica*
aa. Flowers 6–8-merous ..... 2. *C. liberica*

1. **Coffea arabica** L., Sp. Pl. 172. 1753. TYPE: not seen.—FIG. 25.

Shrubs or trees, to 20 m tall, the branchlets straight or flexuous, glabrous, scarcely or moderately swollen at the nodes, the latter well spaced. *Leaves* elliptic oblong, 8–18 cm long, 2.5–7.5 cm wide, distinctly acuminate at the apex, the acumen to 1.5 cm long, often falcate or somewhat hooklike, usually ultimately obtuse, attenuate or widely cuneate at the base, the costa prominulous above, subprominent beneath, the lateral veins 9–11, uniting to form a submarginal undulate vein to 0.8 cm from the margin, thin coriaceous to stiffly papyraceous, usually drying green or grey green; petioles to 1.2 cm long; stipules linear lanceolate, to 1.2 cm long, acute. *Flowers* not seen. *Fruits* plump, oblong rotund, to 1.5 cm long, to 1 cm wide, rounded at the apex and the base, drying black brown or dull olive, glabrous, the calycine scar scarcely elevated, ringlike, to 2 mm in diam.

Coffea arabica is native to Africa and is cultivated throughout the tropical areas of the world. Standley & Williams (1975) discuss the cultivation of *Coffea arabica* in Guatemala. The 5-parted flowers are described in their diagnosis: "... flowers in clusters of 2–9 or more; sessile or nearly so, 12–18 mm long, bractlets ovate, the inner ones connate at the base of the pedicel, shorter than the 5-denticulate calyx; corolla lobes equalling or exceeding the tube; anthers exserted ...."

CHIRIQUÍ: Cafetales above El Cantinero, *D'Arcy 9846* (MO). Finca "Princesa Janca," Boquete, *D'Arcy & D'Arcy 6453* (MO). Fred Collins Finca, Boquete, *Ebinger 725* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 457* (MO). COCLÉ: Forest behind Club Campestre, 700 m, *Duke 13252* (MO). El Valle, *Ebinger 948* (MO). PANAMÁ: Río Maje along river from waterfalls near Bayano Lake ca. 2 mi upstream, *Croat 34553* (MO). Highway 79, Quebrada Sardinilla, 5 km NNE of cement factory, 55 m, *Nee 6581* (MO). Cermeño, *Ochoa 32* (MO).

2. **Coffea liberica** Bull ex Hiern., Trans. Linn. Soc. Ser. 2(1): 171, *tab. 24*. 1876. TYPE: Sierra Leon, *Daniell* (BM, not seen; photo, MO).

Shrubs or trees to 20 ft tall, the twiglets subangular, glabrous, the nodes well spaced. *Leaves* oblong or obovate elliptic, 7.5–8.5 cm wide, short acuminate at the apex, rounded at the base, the lateral veins ca. 12, coriaceous, glabrous; petioles to 2 cm long, stiff. *Flowers* not seen. *Fruits* oblong subrotund, to 2.0–2.5 cm long at maturity (fide Standley & Steyermark), lightly grooved.

Coffea liberica is native to Liberia and to areas of West Africa. It is cultivated throughout tropical areas of the world. Standley & Williams (1975) describe the 6–8-parted flowers as "... several in a cluster, subsessile, 2.5 cm long; bractlets shorter than the subtruncate calyx; corolla lobes about as long as the tube; anthers not exserted." "Liberian Coffee."

COLÓN: Achiote, *Tyson et al. 4508* (MO).

23. CONDAMINEA

Condaminea DC., Prodr. 4: 402, 1830. LECTOTYPE: *C. corymbosa* (R. & P.) DC.

Shrubs or small trees. *Leaves* large, coriaceous; stipules large, bipartite. *Inflorescences* terminal, spreading, cymose or corymbose; bracteoles absent. *Flow-*

FIGURE 25. *Coffea arabica* L. Habit (×½). [After *Ochoa 32.*]

ers pedicellate; hypanthium turbinate campanulate, the calycine cup with 3–5 lobes or teeth; corolla funnelform or campanulate, the tube cylindrical, villous in the throat, the lobes 5, valvate, glabrous; stamens 5, the anthers exserted, narrow, sagittate, the filaments thick, inserted below the corolla mouth; ovarian disc depressed, the ovary 2-celled, the style stout, filiform, exserted, the stigma oblong, obtuse, the ovules numerous. *Fruits* capsular, turbinate, truncate, thick walled, dehiscing loculicidally into 2 valves; seeds minute, attached horizontally, the testa reticulate.

Condaminea occurs sporadically throughout Middle America and occurs in tropical South America. There are about 3 species in the genus.

a. Leaves oblong, to 50 cm long, the lateral veins ca. 20; petioles absent or to 1 cm long ---- 1. *C. corymbosa*

aa. Leaves lanceolate, to 15 cm long; the lateral veins ca. 10; petioles 0.7–1.2 cm long ---- 2. *C. petiolata*

1. **Condaminea corymbosa** (Ruiz & Pavón) DC., Prodr. 4: 402. 1830.—FIG. 26.

Macrocnemum corymbosum Ruiz & Pavón, Fl. Peruv. Chil. Prodr. 2: 48. 1799. TYPE: not seen.

Shrubs or small *trees* to 7 m tall, the branches terete, stout, smooth, glabrous or puberulent. *Leaves* oblong, to 50 cm long, to 21 cm wide, deltoid to vaguely obtuse at the apex, basally truncate to subcordate, the costa plane or prominulous above, prominent beneath, to 3 mm wide, the lateral veins usually ca. 20, usually 1.5–2.5 cm apart, coriaceous, glabrous to golden puberulent beneath, the intervenal areas often delicately wrinkled; petioles either absent or to 1 cm long, stout, rimose, glabrous; stipules interpetiolar, connate, to 4 or 5 cm long, to 0.6 cm wide at the base forming a sheath, each part with 2 subulate awns longer than the sheath, acute, coriaceous, puberulent, rubescent. *Inflorescences* terminal, spreading paniculate, to 40 cm long, the peduncle 15–20 cm long, with 3 primary branches at the tip, 10–15(–21) cm long, angular ascending or arcuate, each terminating in either 3 radially disposed secondary branches or in a few branches. *Flowers* with the hypanthium oblong, to 1 cm long, to 0.6 cm wide, tapering cuneately below, the calycine cup short, dilated, the margin with 4 or 5 broad, strongly compressed rotund or widely triangular lobes, coriaceous, glabrous; corolla white, the tube cylindrical, ca. 2× longer than wide, to 2 cm long, carnose, glabrous inside and out, the lobes 5, triangular or oblong, to 1 cm long, glabrous; stamens 5, the anthers narrowly oblong, ca. 7 mm long, ca. 1.2 mm wide, retuse at the apex, the filaments short, plane, attached at the upper ⅔ of the tube; style plane, attenuate at the base, to 1.5 cm long; stigmas 2, to 5 mm long, ca. 0.7 mm wide, truncate, the ovary thin walled, the locules 2–3, the ovules numerous on 2–3 intrusive, C-shaped placentas as seen in cross section. *Fruits* oblong or obovate oblong, 1–1.5 cm long, ca. 1 cm wide at the base, ligneous, glabrous, drying black, topped by a conspicuous and shallow ringlike scar, splitting longitudinally into 2 or 3 thin valves; seeds numerous.

Condaminea corymbosa ranges from Costa Rica to Bolivia.

CHIRIQUÍ: Boquete, *Davidson 792* (F, MO, US). 12.4 mi N of David, *Lewis et al. 692* (GH, K, MO, NY, PMA, UC, US). 17 km NE of San Félix, road to Cerro Colorado, 1000 m, *Nee 10718* (MO). San Félix, *Pittier 5252* (F, US). DARIÉN: Piñas, *Duke 10621* (MO).

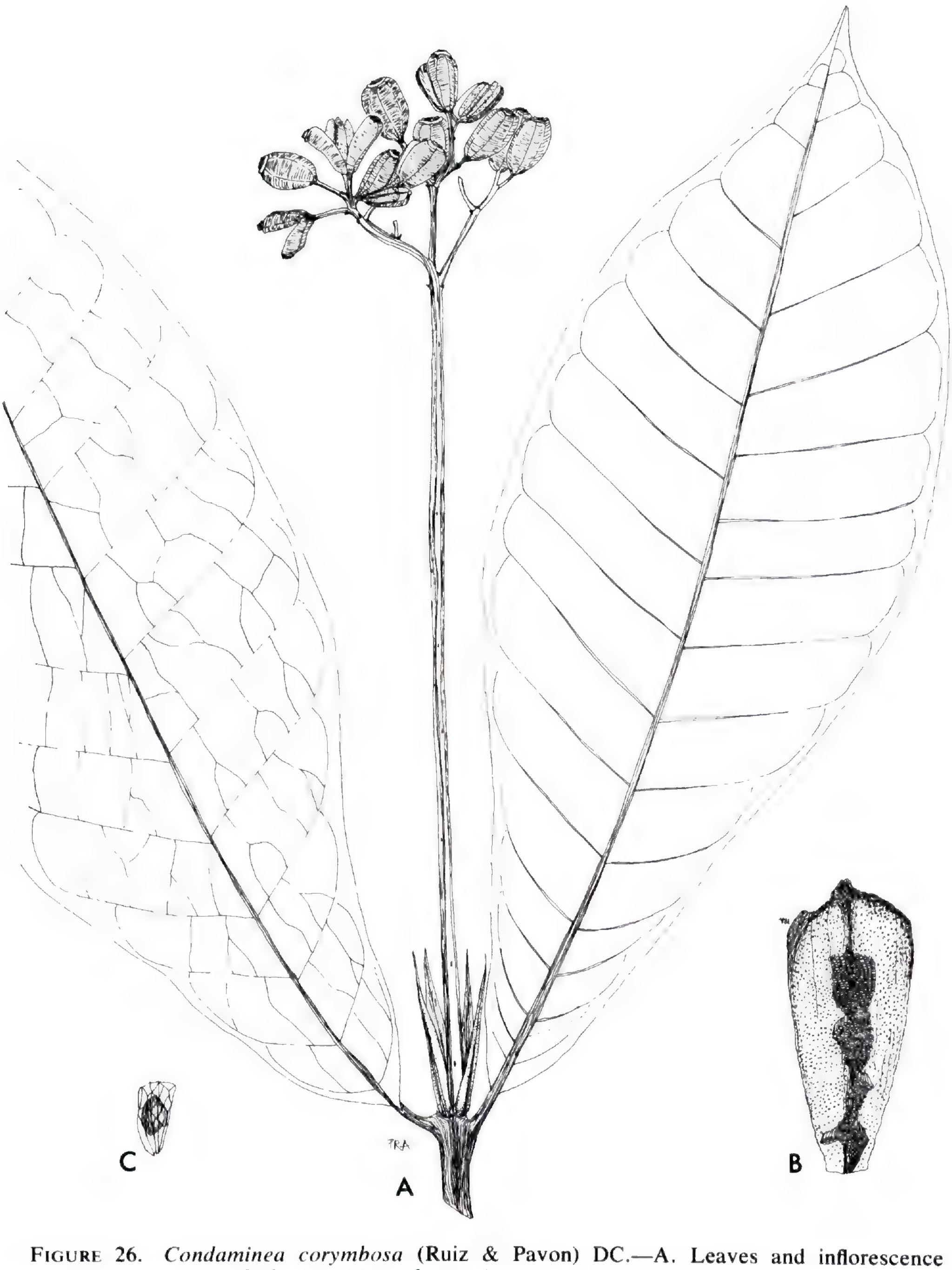

FIGURE 26. *Condaminea corymbosa* (Ruiz & Pavon) DC.—A. Leaves and inflorescence (×½).—B. Fruit (×3.5).—C. Seed (×21). [After *Duke 10621*.]

2. **Condaminea petiolata** Dwyer.[30] TYPE: Panamá, *Croat 34706* (MO, holotype).

Shrubs to 2 m, the twigs slender, glabrous, obtusely angled, the nodes well spaced. *Leaves* lanceolate, to 15 cm long, to 4.5 cm wide, acute at the apex and the base, the costa prominulous above and beneath, the lateral veins ca. 10, strongly arcuate, plane above, prominent beneath, the intervenal areas open reticulate, chartaceous, discolorous, the hairs appressed, white, elongate, more dense beneath especially on the costa and the veins; petioles 0.7–1.2 cm long, ca. 0.2 cm wide, pubescent; stipules persistent at the apex of the twigs, connate basally, turgid, the sheath 1–2 mm long, each part with an erect triangular process, attenuate toward the apex, to 0.6 cm long, acute, vaguely thickly carinate, villose outside, densely villose at the base within and often with a few conspicuous black glands on the margin within, the glands oblong, ca. 0.5 mm long. *Inflorescences* axillary, paniculate; peduncle slender, to 0.3 cm wide, the corymbs disposed toward the apex of 2–3 pairs of short, arcuate, ascending, opposite branches, these 3–5 mm long; bracts not seen; bracteoles subulate. *Flowers* not seen. *Fruits* sessile, oblong, coriaceous, to 1 cm long, less than 2 times longer than wide, truncate at the apex, pubescent outside, delicately ribbed, the persistent calycine cup scarcely measurable or to 1 mm long, the 2 carpels loculicidally dehiscent, lignose, yawning apically, the endocarp smooth, thick, drying yellow, finally free from mesocarp; seeds numerous, plano compressed, fusiform, ca. 2 mm long, shiny.

Condaminea petiolata is known only from Panama. It is distinguished by its leaves having few lateral veins and by its axillary inflorescence. The fruits are smaller than those of *C. corymbosa*.

PANAMÁ: Río Maje, near new Bayano Lake, 100 m, *Croat 34706* (MO).

24. COSMIBUENA

Cosmibuena Ruiz & Pavón, Fl. Per. Chil. Prodr. 3: 2. 1802. Nomen conservandum. TYPE: *C. obtusifolia* Ruiz & Pavón not *Cosmibuena* Ruiz & Pavón (1794). Nomen rejiciendum (Chrysobalanaceae). Buena Pohl, Pl. Bras. Ic. 1: 8. 1827.

Shrubs, glabrous, usually epiphytic. *Leaves* fleshy, petiolate; stipules large, deciduous. *Inflorescences* terminal, cymose or the flowers solitary; bracts and bracteoles present. *Flowers* large; hypanthium oblong or turbinate, the calycine cup tubular or campanulate, the teeth 5–6, usually unequal; corolla salverform or funnelform, the tube elongate, 5–6-lobed, the lobes contorted; stamens 5–6, the anthers linear, basifixed, included, the filaments short; ovarian disc cup

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[30] *Condaminea petiolata* Dwyer, spec. nov. *Frutices* ad 2 m alti, ramulis gracilibus glabris obtuse angulatis nodis bene distantibus. *Folia* lanceolata, ad 15 cm longa, ad 4.5 cm lata, acuta, venis lateralibus ca. 10, forte arcuatis, chartacea discoloria; petiolis ad 1.2 cm longis; stipulis connatis turgidis vagina 1–2 mm longa parte utraque processu triangulari erecto ad 0.6 cm longo praedita extus crasso-carinata villosaque. *Inflorescentiae* axillares corymboso-paniculatae pedunculo gracile ad 0.3 cm lato, corymbis versus apicem jugorum 2–3 ramulorum brevium arcuate ascendentium oppositorum, ad 3–5 mm longorum. *Fructus* sessiles oblongi, ad 1 cm longi, coriacei apice truncati extus pubescentes modice costati.

shaped, the style elongate, clavate at the apex, the stigmas 2. *Fruits* capsular, narrowly oblong or cylindrical, septicidally bivalvate from the apex, the epicarp separating from the endocarp; seeds numerous, oblong, the body small, the testa membranous, produced at each end into a narrow wing.

a. Calyx cup ca. 1.1 cm long, the teeth only minute points; corolla tube to 7.5 cm long ..... 1. *C. ovalis*

aa. Calyx cup 3.3–5 mm long, the teeth 1.5–3 mm long; corolla tube 6–10 cm long ..... 2. *C. skinneri*

1. **Cosmibuena ovalis** Standley, Contr. U.S. Natl. Herb. 18: 137. 1916. TYPE: Panamá, *Pittier 5074* (US, holotype; NY, isotype).

Trees to 30 ft tall, 4 inches d.b.h., terete, drying dark, the nodes well spaced. *Leaves* rhomboid, oblong rotund or elliptic oblong, 12–17 cm long, 5.5–8.5 cm wide, deltoid, rounded or obtuse at the apex, acuminate, the acumen vague, short, basally cuneate or attenuate cuneate, the costa plane or prominulous above, prominulous beneath, to 0.2 cm wide, the lateral veins 5–6, at first strict and strongly ascending, arcuate toward the margin, the submarginal vein indistinct, stiffly chartaceous, discolorous, glabrous above except the puberulent costa, glabrous beneath except puberulent along the lowermost part of the costa and along the lateral veins; petioles to 1 cm long, to 0.15 cm wide in the middle, puberulent, expanded at point of attachment; stipules not seen. *Flowers* 2 at the end of the twiglet, erect, the calyx collar shaped, to 1.1 cm long, to 0.6 cm wide, truncate, the teeth minute points to 0.5 mm long, acute, rigid, glabrous; corolla tube narrowly cylindrical, to 7.5 cm long, to 0.3 cm wide in the middle, glabrous, scarcely expanded at the apex, the lobes oblong, 2–2.5 cm long, 1–1.3 cm wide, obtuse, glabrous; style exserted, probably to 8.5 cm long, densely golden villose. *Fruits* not seen.

Cosmibuena ovalis is known only from Costa Rica and Panama. The above description is sketchy, as only one collection was available except for the type.

CHIRIQUÍ: Rio Macho de Monte, 1 mi E of Cuesta de Piedra, 2800 ft, *Tyson 904* (MO). COCLÉ: 100–350 m, Olá, *Pittier 5074* (NY, US).

2. **Cosmibuena skinneri** (Oerst.) Hemsl., Biol. Centr. Amer., Bot. 2: 12. 1881.

Buena skinneri Oerst. Vidensk. Meddel. Dansk Naturhist. Foren. Kjobenhavn 26: 1852. TYPE: Nicaragua, *Oersted 11134* (not seen, holotype, photo, MO).

Cosmibuena paludicola Standley, Contr. U.S. Natl. Herb. 18: 137. 1916. TYPE: Panamá, *Pittier 4107* (US, holotype; NY, isotype).

Trees to 25 ft tall, the branchlets terete, smooth, glabrous, often drying gray or tan, frequently angular, the nodes usually well spaced. *Leaves* obovate oblong, occasionally oblong subrotund, 6–16 cm long, 2.7–7.5 cm wide, obtuse or rounded at the apex, cuneate at the base, the costa prominulous above and beneath, often evanescent distally, 1–1.5 mm wide at the base, the lateral veins 5–7, prominulous, evanescent, strongly ascending, coriaceous, glabrous; petioles to 2 cm long, to 0.25 cm wide, lignose, glabrous; stipules deciduous, oblong rotund, ca. 1.5 cm long, 1 cm wide, obtuse, coriaceous, glabrous, often with a thickened keel below the middle. *Inflorescences* terminal, the peduncle short, to 1 cm stout, glabrous,

FIGURE 27. *Cosmibuena skinneri* (Oerst.) Hemsl.—A. Flowering branch (×½). [After *Croat 6326.*]—B. Fruiting branch (×½). [After *Croat 5057.*]—C. Flower (×1).—D. Seed (×2). [After *Gentry 5761.*]

drying much darker than the stem tip, the flowers 3–6, ascending. *Flowers* 1–2 cm long (pedicels and hypanthium), ca. 0.4 cm wide, glabrous, marcescent; calycine cup 3.3–5 mm long, glabrous, coriaceous, the teeth 5, widely triangular, disposed as points 1.5–3 mm long, acute or obtuse; corolla white, the tube nar-

rowly cylindrical, 6–10 cm long, ca. 0.3 mm wide, drying brown, subcoriaceous, glabrous, the lobes 5, oblong, 1.9–3.5 cm long, 0.9–1.2 cm wide, obtuse, often glabrous, often drying yellow abaxially, brown adaxially; stamens 5, the anthers narrowly oblong, 1.0–1.2 cm long, ca. 0.15 cm wide, the filaments short, inserted near the middle of the corolla tube, anthers basifixed; stigmas 2, digitiform or oblong, to 1 cm long, 1.8 cm wide, obtuse, the style slender, as long as the corolla tube, ca. 1 mm wide, villose for ca. 6 mm below the stigmatic lobes, the latter oblong, ca. 5 mm long, obtuse. *Fruits* pedicellate for ca. 2 cm, narrowly oblong, often falcate, to 7.5 cm long, to 0.8 cm wide, terete in cross section, rounded at the apex with an annular scar, the calyx rarely persistent, to 0.3 cm long, the ovarian disc persistent as a cylindrical projection, to 2 mm long, ca. 1.3 mm wide, attenuate at the base, ligneous, glabrous, conspicuously lenticellate.

Cosmibuena skinneri ranges from Mexico to Colombia. Croat has noted on labels that the flowers are pollinated by hawkmoths.

PANAMA: CANAL ZONE: Gatún, *Higgins 400* (MO). BARRO COLORADO ISLAND: *Aviles 78* (MO); *Bangham 473* (F); *Croat 5057, 6326, 6554, 7833, 8519, 9029, 9853, 12285, 12444* (all MO); *Foster 1912* (F); *Knight 8* (F); *Shattuck 863* (MO); *Woodworth & Vestal 771* (MO). COCLÉ: El Valle, *Allen 2798* (MO). 2 km from El Greco Hotel, El Valle, *Correa & Dressler 997* (MO). Las Margaritas & El Valle, *Woodson et al. 1738* (MO). COLÓN: Santa Rita Ridge, *Correa & Dressler 695* (MO); *D'Arcy & D'Arcy 6162* (MO). María Chiquita, E of Río Piedras, *Dwyer & Kirkbride 7773* (GH, F, K, MO, NY, PMA, UC). Santa Rita Ridge, *Dwyer & Gentry 9394* (MO). Vienta Frío, *Pittier 4107* (US). DARIÉN: Río Pinas, *Duke 10546* (MO). PANAMÁ: Cerro Campana, *Correa & Dressler 1032* (MO); *Duke 6008* (MO); *Dwyer & Kirkbride 7829* (MO); *Ebinger 917* (MO); *Gentry 5761* (MO); *McDaniel 6921* (MO). SAN BLAS: Puerto Obaldía, *Gentry 1496* (MO). WITHOUT EXACT LOCALITY: *Duke 6193* (MO). COLOMBIA: CHOCO: Between Camp Curiche and Quebrada Changame, 3.7 mi S of Camp Curiche, *Duke & Idrobo 11574* (NY).

25. COUSSAREA

Coussarea Aubl., Hist Pl. Guiane 1: 98. 1775. TYPE: *C. violacea* Aubl.

Trees or shrubs. *Leaves* often coriaceous; stipules usually entire and connate, short, obtuse, often semiorbicular. *Inflorescences* terminal or rarely axillary, paniculate or umbellate, many flowered, the peduncle usually present, the branchlets ultimately cymose; bracts slender or much reduced. *Flowers* usually 4-merous, rarely sessile, the bud rounded or truncate; hypanthium occasionally with 4 lobes or teeth; corolla funnelform or salverform, the throat naked, the lobes 4, valvate; anthers subsessile; stigmas 2, the lobes filamentous, the ovary 2-celled, the ovules 2, longer than broad, erect, connate by means of a thin, evanescent septum. *Fruits* drupaceous, oval, 1-seeded by abortion of the second seed, the seed vertical, ellipsoid, usually smooth, often one side convex.

Coussarea occurs throughout tropical America. It includes about 100 species.

One species of *Viburnum, V. costaricanum* (Oerst.) Hemsley, well collected in Chiriqui, may be easily mistaken in the fruiting stage for a *Coussarea*, but the fruit may be distinguished from *Coussarea* species by its persistent ovarian disc which is triangular but conspicuously capitate at the apex, measuring ca. 0.4 mm long.

Literature:

Dwyer, J. D. and M. Hayden. 1966. Notes on *Coussarea* (Rubiaceae) especially the Panamanian Species. Ann. Missouri Bot. Gard. 53: 368–374.

a. Leaves coriaceous, inflorescence 3–5 cm wide.
  b. Leaves with lateral veins 16–25; petioles less than 1 cm long; stipules 0.25–0.5 cm long.
    c. Leaves petiolate, the lateral veins ca. 16; calycine cup ca. 3 mm long ---------- 3. *C. durifolia*
    cc. Leaves sessile, the lateral veins ca. 25; calycine cup ca. 9 mm long ---------- 5. *C. garciae*
  bb. Leaves with lateral veins ca. 9; petioles 1–3 cm long; stipule 1–1.5 cm long.
    d. Leaves 9.0–16.5 cm wide; fruits to 2 cm long ---------- 7. *C. latifolia*
    dd. Leaves 1–5 cm wide; fruits to 1 cm long ---------- 6. *C. jefensis*
aa. Leaves chartaceous or if coriaceous (*C. paniculata*) the inflorescence to 6 cm wide.
  e. Leaves obviously petiolate.
    f. Petioles to 0.5 cm long ---------- 2. *C. curvigemmia*
    ff. Petioles 0.6–5.0 cm long.
      g. Calycine cup ca. 16 mm long; corolla tube ca. 33 mm long ---------- 4. *C. enneantha*
      gg. Calycine cup 0.2–7.0 mm long; corolla tube less than 20 mm long.
        h. Inflorescence patulous, open.
          i. Leaves with lateral veins 11–15.
            j. Calycine cup ca. 0.5 mm long ---------- 14. *C. veraguensis*
            jj. Calycine cup ca. 2.5 mm long ---------- 8. *C. loftonii*
          ii. Leaves with lateral veins 5–10(–12).
            k. Leaves with lateral veins 5–6 ---------- 10. *C. nebulosa*
            kk. Leaves with lateral veins 7–10(–12).
              l. Calycine cup ca. 16 mm long ---------- 4. *C. enneantha*
              ll. Calycine cup 0.5–7.0 mm long.
                m. Leaves with lateral veins ca. 12; petioles 2–5 cm long ---------- 1. *C. cerroazulensis*
                mm. Leaves with lateral veins 8–10; petioles 0–1.5 cm long.
                  n. Calycine cup ca. 5 mm long; flowers pink ---------- 13. *C. roseo-cremea*
                  nn. Calycine cup 1–2 mm long; flowers white.
                    o. Petioles (longest) 2.0–2.5 cm long; fruits to 2.7 cm long ---------- 11. *C. neei*
                    oo. Petioles (longest) ca. 1.5 cm long; fruits 1.2–1.6 cm long ---------- 12. *C. paniculata*
                      p. Leaves coriaceous; calyx puberulent, edentate.
                      pp. Leaves thinly chartaceous; calyx glabrous, often with teeth ---------- 9. *C. morii*
        hh. Inflorescence obviously contracted ---------- 15. *C. villosula*
  ee. Leaves sessile ---------- 5. *C. garciae*

1. **Coussarea cerroazulensis** Dwyer & Hayden, Ann. Missouri Bot. Gard. 53: 374. 1966. TYPE: Panamá, *Dwyer 1368* (MO, holotype).

Trees 5–10 m tall, the branchlets terete, densely villosulose, the nodes well spaced, often turgid with evident stipule bases. *Leaves* elliptic, 15–33 cm long, 5–14 cm wide, acute or conspicuously acuminate, the acumen slender, often narrowly caudate, to 2 cm long, basally cuneate, the costa prominulous above,

prominent beneath, the lateral veins ca. 12, widely arcuate, prominent beneath, densely golden pubescent, often velutinous to the touch, coriaceous; petioles 2–5 cm long; stipules not seen. *Inflorescences* terminal, sessile, to 12 cm long in fruit, to 6 cm wide, with 3 pairs of opposite, well-spaced branches, the lowermost to 2 cm long, each terminated by a 3-flowered cymule. *Flowers* with the hypanthium squarish in lateral view, coriaceous, densely golden villose, the calycine cup cylindrical, about as wide at the base as at the apex, to 7 mm long, ca. 3.5 mm wide, coriaceous, eglandular within, the hairs outside ferrugineous, long and spreading, the hairs within appressed, ferrugineous, the margin undulate, with 4 irregular triangular teeth, these often curved, to 1 mm long; corolla with the tube narrowly cylindrical, ca. 1.7 cm long, to 3.5 mm wide, somewhat falcate, expanded above the middle, coriaceous, densely appressed hairy outside, glabrous within, the lobes 4, narrowly oblong, ca. 15 mm long; stamens 4, the anthers narrowly oblong, ca. 7 mm long, sagittate at the base, the filaments plane, ca. 1 mm long, glabrous, attached near the middle of the tube; style slender, ca. 5 mm long, the stigmas subulate, somewhat plane, ca. 5 mm long. *Fruits* globose, 1–3 cm long, densely puberulent, the persistent calyx narrowly cylindrical, to 1 cm long, ca. 0.4 cm wide, the wall of the fruit 2–3 mm thick.

Coussarea cerroazulensis is known only from Panama. Two striking features of the species are the elongate petioles, to 5 cm long, and the elongate filaments of the stamens which are almost as long as the elongate anthers.

PANAMÁ: Cerro Jefe, *Croat 13052* (MO), *15189* (MO, NY). Without other locality, *Duke 8167* (MO). Goofy Lake and Cerro Jefe, *Blum et al. 2270* (MO). Cerro Jefe, *Duke & Dwyer 15064* (MO); *Duke 8167* (MO). Cerro Azul, *Dwyer 1368* (MO). Between Cerro Jefe and La Eneida, *Dwyer 8199* (MO, NY). Cerro Azul, *Gallegos et al. 5174* (MO). Cerro Jefe, 2900 ft, *Gentry 2147* (MO). 2–8 mi S of Goofy Lake, *Lewis et al. 2161* (DUKE, F, GH, K, MO, NY, PMA, UC, US). Gorgas Lab, ca. 25 km NE of Cerro Azul, 550 m, *Mori & Kallunki 3267* (MO). NE of town of Cerro Azul, 20 km by road from Panamerican Highway, *Mori & Kallunki 3654* (MO). 5–10 km NE of Altos de Pacora, ca. 750 m, *Mori & Kallunki 4969* (MO).

2. **Coussarea curvigemmia** Dwyer, Phytologia 38: 215. 1978. TYPE: Panamá, *Croat 14863* (MO, holotype).—FIG. 28.

Shrubs or small trees, to 5 m tall, the branchlets terete, glabrous, ashen gray when dry, the nodes well spaced. *Leaves* oblong or lanceolate, 6.5–25.0 cm long, 2.0–13.5 cm wide, scarcely or strongly inequilateral, often falcate, acuminate, the acumen straight or curved, to 1.5 cm long, obtuse, cuneate at the base or sometimes obtuse or lightly auriculate, the costa subplane to prominulous above, prominulous beneath, the lateral veins 6–9, widely arcuate, the venules 1–3 between adjacent lateral veins, these branching and reticulate, the petioles lacking or to 0.5 cm long, glabrous; stipules triangular, to 4 mm long, rounded toward the apex, glabrous. *Inflorescences* solitary, terminal, glabrous to puberulent, thrysoid paniculate, to 6 cm long, to 4.5 cm wide; peduncle slender, 1–2 cm long, the primary branches alternate or opposite, to 2 cm long, ascending, the rachis often with 2 pairs of terminal branches, alternate or opposite, flabellate in appearance, the flowers congested, sessile or subsessile. *Flowers* with the hypanthium oblong or oblong rotund, often shorter than the calyx cup, the latter cylindrical or collar shaped, 1.5–2.5 mm long, truncate, stiffly petaloid, glabrous or

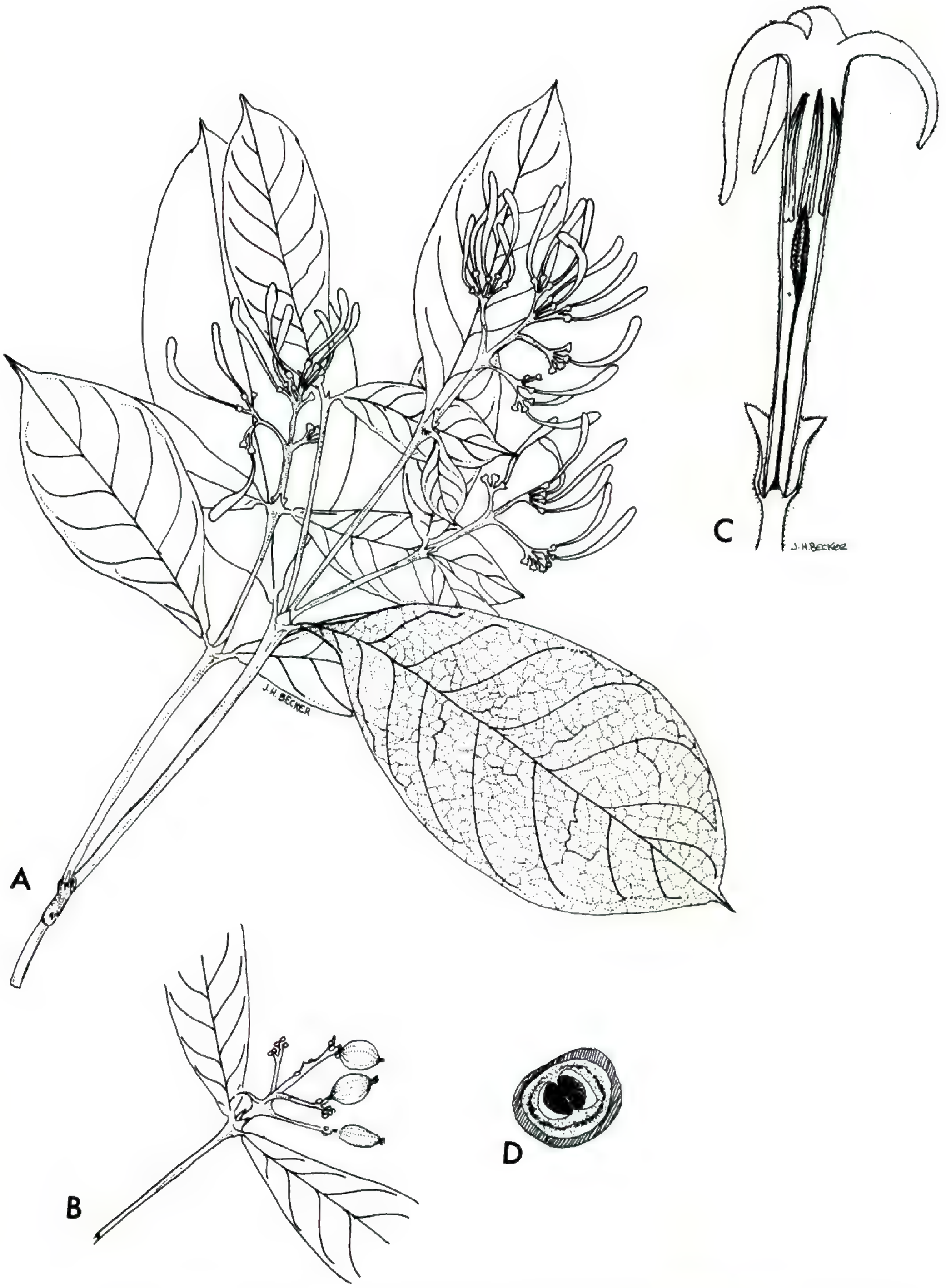

FIGURE 28. *Coussarea curvigemmia* Dwyer.—A. Habit (×½).—B. Fruiting branch (×½).—C. Flower, opened to show stamens and style (×3.5).—D. Ovary cross section (×5). [After *Croat 7308*.]

puberulent on the outside; the teeth 5 or absent, triangular, to 0.5 mm long, often with minute, glandular red spots on the margin; corolla white, the tube narrow cylindrical, often falcate, 6–16 mm long, ca. 1.5 mm wide, petaloid, glabrous or puberulent outside, glabrous within, the lobes 4, narrowly oblong, 7–8 mm long, glabrous within, not cucullate; stamens 4, the anthers linear, 4.5–5.7 mm long, acute with a minute apiculum, the filaments short, ca. 1 mm long, attached above the middle of the tube; ovarian disc prominent, to 0.65 mm high, ca. 1 mm wide, the style short or long, included or scarcely exserted, linear, 6–16 mm long, the stigmas 2, linear oblong, 1.5–3.0 mm long, ca. 0.1 mm wide. *Fruits* ellipsoid, often laterally compressed, 1.2–1.5 cm long, to 0.7 cm wide, glabrous, at first fleshy and spongy, the pulp glistening white, the surface often lenticellate when dry; seed solitary with a hard testa filling the cavity, the calyx persistent, to 1.5 mm long, to 1.2 mm wide.

Coussarea curvigemmia is known only from Panama and Costa Rica. Most of the material cited below has previously been erroneously assigned to *Coussarea impetiolaris* Donnell Smith which unlike this species has subquadrangular branches, a corolla tube up to 2 mm in width, much more elongate anthers which are up to 8 mm long, and a fruit which in the dried condition is about 19 mm long. The type of *Coussarea impetiolaris* is *Pittier 134008* (US, syntype) from Costa Rica.

Most fruits on herbarium material have only the fibrous endocarp visible. One collection, *Dwyer 2012* (MO) shows the fleshy outside of the fruit still present. These fruits measure to 1.5 cm in length; those with only the endocarp present measure to 1.2 cm in length.

BOCAS DEL TORO: Almirante, *Gentry 2770* (MO). CANAL ZONE: C-19 Road, *Blum 1901* (MO). Nuevo Emperador, *Blum 2393* (MO). K-6 Road, *Dwyer 2853, 5021* (both MO). Madden Dam, *Dwyer 9161* (MO); *Hayden 74* (MO); *Kant 24* (MO). Boy Scout Camp Road near Madden Dam, *Mori 4040* (MO). Madden Dam, *Porter et al. 4051* (MO, SCZ, UC, VEN). Macapale Island, *Tyson 5475* (MO). BARRO COLORADO ISLAND: *Croat 4892, 5465, 5873, 6201, 6282, 7308, 8600, 10295A, 10973, 14863* (all MO); *Ebinger 171, 565, 610* (all MO); *Foster 1779* (MO); *Hayden 34* (MO); *Killip 39987* (MO); *Oppenheimer 66-11-2-1259* (MO); *Shattuck 135, 621* (both MO); *Starry 50* (MO); *Wetmore & Abbe 18* (MO). COCLÉ: Cerro Pilón, *Dwyer & Lallathin 8630* (MO). COLÓN: Santa Rita Ridge, *Dwyer et al. 8982* (MO). DARIÉN: Santa Fé, *Duke & Bristan 309* (MO). Yaviza, *Duke 4875* (MO). El Real to Pinogana, *Duke 5012A* (MO). Santa Fé, *Duke 12271, 14091* (both MO); *Tyson et al. 4665, 4828* (both MO). Río Chucunaque, *Stern et al. 845* (MO). PANAMÁ: Juan Mina, *Bartlett & Lasser 16572* (MO); *Tyson 5459* (MO). Cerro Azul, *Dwyer 7093* (MO). Cerro Jefe, *Gentry 6781* (MO). Villa Rosario, near Capira, *Saldana 41* (MO).

3. **Coussarea durifolia** Dwyer.[31] TYPE: Panama, *Liesner 1180* (MO, holotype).

Small *trees* to 4 m tall, the twiglets thick, ultimately somewhat angular, smooth, glabrous, the nodes well spaced, somewhat turgid, the leaf scars triangular or subrotund, ca. 0.5 cm long. *Leaves* obovate or obovate oblong, to 22 cm long, to 12 cm wide, obtuse or rounded at the apex, acuminate, the acumen short, to 5 mm long, cuneate or obtuse at the base, the costa prominulous or subplane above, prominent beneath, convex, the lateral veins ca. 17, arcuate, the sub-

[31] *Coussarea durifolia* Dwyer, spec. nov. *Arbores* parvae vel frutices. *Folia* obovata vel obovata-oblonga, apicem verus obtusa vel rotundata, brevi-acuminata venis lateralibus ca. 17, coriacea in sicco smargadina glabra; petiolis nullis vel ad 1 cm longis; stipulis ovato-triangularibus. *Inflorescentiae* terminales, ramis paucis floribus patulis. *Flores* sessiles. *Fructus* non visi.

marginal vein undulate, 2–3 mm from the margin, the intervenal areas reticulate, coriaceous, emerald green beneath when dry, glabrous; petioles absent or to 1 cm long, to 0.35 cm wide, glabrous when dry; stipules free, ovate triangular, to 1 cm long, basally ca. 0.65 cm wide, obtuse, coriaceous, with minute dots outside, to 0.2 mm in diam. *Inflorescences* terminal, solitary, to 7 cm long, to 5 cm wide, glabrous, drying black; peduncle to 2 cm long, to 0.35 cm wide, the branches few, short, to 2 cm long, the flowers spreading. *Flowers* sessile, the perianth parts carnose; hypanthium oblong, 2.5–4.0 mm long, minutely puberulent or glabrescent, the calycine cup turgid, collarlike, ca. 3 mm long, ca. 3.5 mm wide, truncate, the teeth 4 or scarcely visible, ovate oblong, 0.8–1.5 mm long, reflexed, obtuse; corolla cream colored, the tube narrowly hypocrateriform, ca. 1.4 cm long, minutely puberulent outside, glabrous within, the lobes 4, narrowly oblong, 7–9 mm long; stamens 4, the anthers narrowly oblong, ca. 6 mm long, ca. 0.7 mm wide, the filaments short, ca. 1.5 mm long, plane, attached near the middle of the tube; style slender, ca. 4 mm long, the stigmas 2, linear oblong, ca. 2 mm long. *Fruits* not seen.

Coussarea durifolia is known only from Panama. It is readily recognized by its coriaceous leaves which dry an emerald green beneath. The lateral veins are unusually numerous for a *Coussarea*. The black punctations of the stipules are probably diagnostic.

PANAMÁ: El Llano-Cartí highway, 20 km N of El Llano, *Dressler 4352* (MO). El Llano-Cartí road, 12 mi above Panamerican Highway, *Liesner 1180* (MO).

4. **Coussarea enneantha** Standley, J. Wash. Acad. Sci. 18: 282. 1928. TYPE: Panamá, *R. S. Williams 841* (US, holotype; isotype, NY).—FIG. 29.

Shrubs 4(–7) m tall, the branchlets subterete, slender, the internodes well spaced. *Leaves* elliptic oblong, 9–16(–24) cm long, 3.2–8.0(–13.0) cm wide, acuminate, the acumen to 1.5 cm long, usually falcate, obtuse, acute or cuneate at the base, somewhat inequilateral, the costa prominent, the lateral veins (7–)10–12, joining to form a usually distinct submarginal vein, the venules reticulate, membranous to stiffly chartaceous, concolorous or discolorous, villosulose or villose on veins and costa above and beneath; petioles slender or stout, 1.2–3.5 (–4.2) cm long, 0.1–0.2 cm wide, pubescent; stipules connate, the sheath ca. 3 mm long, pubescent. *Inflorescences* terminal, usually sessile or the peduncle to 1 cm long, trichotomous, the branches spreading, curved, to 8 cm long, slender, ca. 1 mm wide, densely golden pubescent, each branch with 3 flowers at the apex. *Flowers* sessile; hypanthium including calycine cup narrow cylindrical, to 16 mm long, ca. 3.3 mm wide, the cup more than twice the length of the hypanthium, villose outside, glabrous within, stiffly carnose; corolla white or cream colored, the tube to 33 mm long, ca. 4 mm wide, densely pubescent outside, sometimes glabrescent, the lobes 4, narrowly oblong, ca. 11 mm long, 2–3 mm wide basally, glabrous adaxially; stamens 4, the anthers narrowly oblong, ca. 7 mm long, ca. 0.7 mm wide, obtuse, the filaments ca. 6.5 mm long, attached submedially in the tube; stigmas 2, digitiform, ca. 3 mm long, the style ca. 13 mm long; ovary oblong in cross section, thin walled. *Fruits* sessile or pedicellate for 3 mm, oblong, to 3 cm long, to 1.5 cm wide, tapering at the apex and base, the calyx persistent, 1.0–1.7 cm long, densely pubescent.

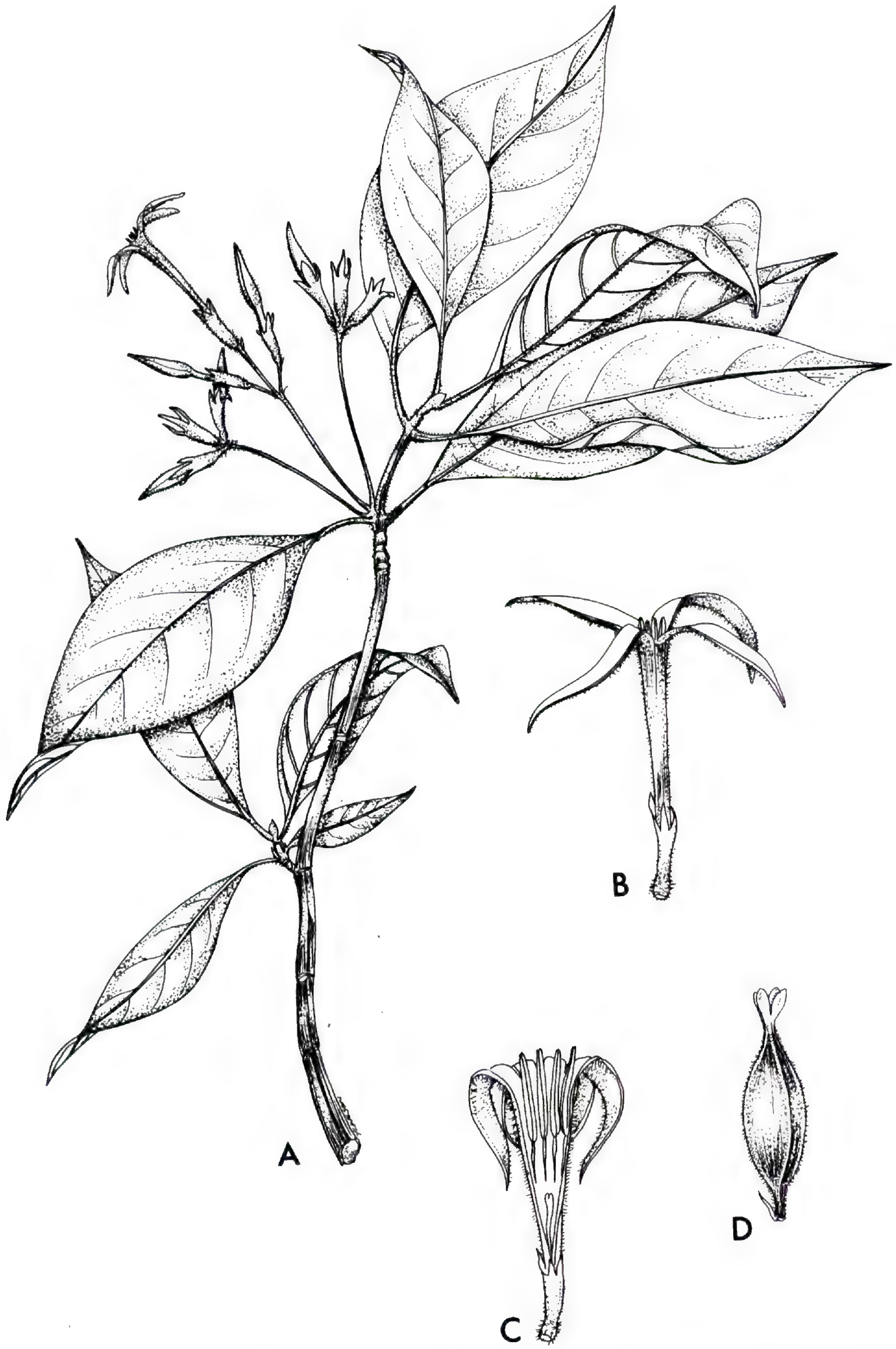

FIGURE 29. *Coussarea enneantha* Standley.—A. Habit (×½).—B. Flower (×1).—C. Flower, dissected showing stamens (×1).—D. Fruit (×1). [After *Duke 15707*.]

Coussarea enneantha is known only from Panama. One collection, *Dwyer & Correa 8892,* has extraordinarily large leaves, up to 24 cm long and 13 cm wide; the indumentum is somewhat reduced on the lower surface of the blade and the fruits are only up to 2 cm long.

BOCAS DEL TORO: Fish Creek Mountains, *Wedel 2364* (MO). COCLÉ: Cerro Caracoral, 900 m, *Duke & Dwyer 15139* (MO). Cerro Gaital Caracoral, *Dwyer & Correa 8892* (MO). Cerro Pilón, *Porter et al. 4402* (MO). DARIÉN: Cerro Pirre, *Bristan 536* (MO). Río Pirre, *Bristan 1462* (MO). Cerro Campamiento, S of Cerro Pirre, *Duke 15707* (MO). Cerro Pirre, 3500–4500 ft, *Duke & Elias 13781* (MO, UC, VEN). Caná-Cuasí trail on Cerro Campamiento, E of Tres Bocas, *Kirkbride & Duke 1239* (MO, NY). Caná, *Williams 841* (NY, US). PANAMÁ: 6.5 km on road N of Goofy Lake, *Nee 9301* (MO).

5. **Coussarea garciae** Standley, Publ. Field Mus. Nat. Hist. Bot. Ser. 22: 180. 1940. TYPE: Colombia, *Killip & Garcia 33524* (F, holotype).

Shrubs or small trees 2.0–3.5 m tall, the branchlets stout, angular above, lenticellate, the nodes somewhat turgid, glabrous, the stipular scars thin, ringlike. *Leaves* sessile, obovate, to 50 cm long (or longer?), to 20 cm wide, obtuse or rounded at the apex, occasionally short acuminate, tapering narrowly and cuneately toward the base and finally vaguely auriculate, the costa slender and prominulous above, prominent beneath, to 0.3 cm wide, lignose, the lateral veins ca. 25, to 3 cm apart, prominulous above, prominent beneath, the veinlets perpendicular, thin coriaceous, occasionally papyraceous, concolorous, drying green, glabrous above and beneath; stipules free, deltoid, to 1.5 cm long, subcoriaceous, marcescent, glabrous. *Inflorescences* terminal, to 5 cm long, the central axis suppressed or to 3 cm long, the branches few, short, the flowers densely aggregated. *Flowers* with the hypanthium ca. 2 mm long, the calycine tube cylindrical, ca. 7 mm long, rounded basally, somewhat turgid, glabrous, petaloid, with a few, well spaced, reddish glands within, the calycine teeth 4, narrowly oblong or narrowly ovate oblong, 10–12 mm long, ca. 2 mm wide at the base, acute; corolla blue, the tube narrowly cylindrical, somewhat curved like an S, ca. 15 mm long, wider above the middle, ca. 2 mm wide at the middle, glabrous, stiffly thin carnose, the lobes 4, narrowly oblong, ca. 6 mm long; stamens 4, the anthers oblong, 4.5–6.0 mm long, subsagittate basally, the filaments slender, 3 mm long, attached near the middle of the tube; style slender: 4 mm long, the stigmas digitiform, 2 mm long. *Fruits* on pedicels 0.3 cm long, elliptic oblong, 2.0–2.8 cm long, to 1.3 cm wide, obtuse at the apex and the base: light brown, smooth, glabrous, the raphides conspicuous under magnification, ribbed, the persistent calyx to 2 cm long, the lobes often withering, narrowly ovate lanceolate, to 12 mm long, glabrous.

Coussarea garciae is known only from Darien and the Dept. of Choco, Colombia. *Duke (11350)* notes that the fruits are eaten in Colombia. "Colorin."

PANAMA: DARIÉN: Between the upper Río Membrillo and Camp 7 on the road to San Blas, *Duke 10878* (MO). Hydro Camp No. 14, Río Salaqui, 6 days upstream from Río Sucio, *Duke 11350* (MO). Río Tuquesa, lower Tuquesa Mining Co. camp, *Mori 6982* (MO). Camp Summit, adjacent to Darién-San Blas border, Sea Level Canal, Route 17, 1000–2000 ft, *Oliver et al. 3679* (MO). COLOMBIA: Between Río Nercua-Quebrada Barrial and Quebrada Ambrosio near Camp Curiche, 10–294 m, *Duke 11435* (MO). Bahia Solano, dense forest along Quebrada Jellita, 50–100 m, *Killip & Garcia 33524* (F, US).

6. **Coussarea jefensis** Dwyer.[32] TYPE: Panamá, *Mori & Joly 7927* (MO, holotype).

Trees to 6 m tall, the branchlets terete, smooth, glabrous, drying dark, the nodes well spaced, turgid, the leaf scars elevated, round, drying whitish with a central circular vascular bundle. *Leaves* oblong rotund to oblong, 3.0–8.5 cm long, 1–5 cm wide, rounded to obtuse at the apex, occasionally vaguely acuminate, obtuse or rounded at the base, the costa prominulous above and beneath, drying red, to 0.15 cm wide proximally, the lateral veins ca. 9, arcuate, prominent beneath, forming an undulate submarginal vein with usually 1 irregular intermediate vein between adjacent lateral veins, the intervenal areas patulous reticulate, the margin slightly revolute, coriaceous, concolorous, drying dark, glabrous, glandular shiny; petioles 1.0–1.3 cm long, stiff, glabrous, to 1.5 mm wide; stipules connate, forming an expanded, coriaceous, glabrous and truncate cup, to 2.5 mm long. *Inflorescences* (in fruit) terminal, paniculate, glabrous, drying dark, to 8.3 cm long, to 4.5 cm wide; peduncle 3.5–4.0 cm long, plano compressed, the lowermost branches opposite, paired, ascending, to 2 cm long, the upper branches to 6, alternate; bracts and bracteoles minute, ca. 1 mm long. *Fruits* subsessile, oblong, rarely vaguely curved, terete in cross section, to 1 cm long, drying black, glabrous, vaguely 2-lobed, not costate; seed solitary, oblong, to 5 mm long, to 4 mm wide, obtusely 3-angled in cross section, with a thin horizontal ridge on the adaxial surface.

Coussarea jefensis is immediately distinguished from all other *Coussarea* in Panama by its thick-coriaceous leaves which are oblong rotund to rotund. The elevated large leaf scars are diagnostic.

PANAMÁ: Cerro Jefe, ca. 2900 ft, *Mori & Joly 7927* (MO).

7. **Coussarea latifolia** Standley, J. Wash. Acad. Sci. 18: 281. 1928. TYPE: Costa Rica, *Tonduz 9574* (US, holotype).

Trees to 15 m tall, glabrous throughout, the twiglets stout, 4-angled, lenticellate. *Leaves* broadly elliptic obovate to broadly ovate elliptic, 16.5–25.0 cm long, 9.0–16.5 cm wide, acute or obtuse at the base, the costa and lateral veins stout, salient beneath, the lateral nerves 9, arcuate, papyraceous, concolorous, pale green when dry; petioles stout, 1.7–2.5 cm long; stipules persistent above, semiorbicular, ca. 5 mm long, wider than long, intrapetiolar, shortly connate, broadly rounded at the apex. *Inflorescences* terminal, glabrous, to 6 cm long, to 5 cm wide, the peduncle to 2 cm long, to 0.35 cm wide. *Flowers* sessile or subsessile; hypanthium short, glabrous, the calycine cup cylindrical, ca. 9 mm long, ca. 6 mm wide at the apex, the latter truncate, coriaceous, glabrous, dentate, eglandular; corolla (seen only in part) narrow below, presumably falcate, coriaceous,

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[32] *Coussarea jefensis* Dwyer, spec. nov. *Arbores* ad 6 m altae ramulis laevibus glabris nodis cicatricibus foliorum conspicue rotundis ornatis. *Folia* oblongo-rotunda ad oblonga, 3.0–8.5 cm longa, 1–5 cm lata, apice rotundata vel obtusa venis lateralibus ca. 9, coriacea, glabra; petiolis 1.0–1.3 cm longis; stipulis connatis vagina cupulata, ad 2.5 mm longa, truncata coriacea glabra. *Inflorescentiae* terminales paniculatae, ad 8.3 cm longae, ad 4.5 cm latae, pedunculo 3.5–4.0 cm longo, ramulis inferioribus ad 2 cm longis, superioribus ca. 6 alternatis; bracteis et bracteolis minutis. *Fructus* oblongi, ad 1 cm longi, glabri, vix 2-lobati.

glabrous outside, pubescent within; stamens 4, included in the tube, the anthers lunate or S-shaped, 5–6 mm long, tapering at the apex, cordate at the base, the filaments ½ to almost as long as the anthers, presumably attached at the middle of the tube; ovarian disc prominent. *Fruits* oblong, to 2 cm long, often somewhat falcate, obtuse or rounded at the apex, green to yellow, lenticellate or smooth, the calycine cup short, smooth, glabrous.

Coussarea latifolia is known only from Costa Rica, Panama, and Colombia.

BOCAS DEL TORO: Above Almirante, *Gentry 2765* (MO). Fish Creek Hills, Chiriquí Lagoon, *Wedel 2218, 2463* (both MO). COLÓN: 10 mi S of Portobelo, 2–4 mi from the coast, 10–200 m, *Liesner 1071* (MO). PANAMÁ: Cerro Jefe, ca. 700 m, *Correa & Dressler 1158* (MO). Between Cerro Azul and Cerro Jefe, *Mori & Kallunki 2173* (MO).

8. **Coussarea loftonii** (Dwyer & Hayden) Dwyer, comb. nov.

Faramea loftonii Dwyer & Hayden, Phytologia 15: 56. 1967. TYPE: Panamá, *Tyson et al. 3323* (MO, holotype).

Shrubs or trees, to 10 m tall, the branchlets terete, drying yellow grey, glabrous, the nodes usually well spaced. *Leaves* salicoid, often falcate, 5–17 cm long, 1.8–5.0 cm wide, the larger blades regularly 3 times longer than wide, tapering acutely or deltoidly at the apex, acuminate, the acumen attenuate, usually narrowly falcate, to 1.5 cm long, 0.1–0.3 cm wide in the middle, acute at the base, slightly inequilateral, the costa scarcely prominulous above, rimose, subplane beneath, the lateral veins 9–12, prominulous, at first strict and then arcuate, or strict to the margin, the intervenal areas markedly reticulate, papyraceous, concolorous, glabrous; petioles to 1 cm long when present, narrowly alate; stipules connate, often persistent, deltoid or compressed rotund, wider than long, 2.5–3.0 mm long, 3–4 mm wide, coriaceous, glabrous. *Inflorescences* terminal, to 5 cm long, to 5 cm wide, cymose paniculate, the peduncle to 2 cm long, ca. 1.5 mm wide, glabrous, the branches 3–4, the lowermost often paired, opposite or subopposite, divergent or ascending, to 1.5 cm long, the terminal cymules with 3–6 flowers; lowermost bracts rarely persisting, narrowly elliptic, to 15 mm long, ca. 1.5 mm wide, glabrous. *Flowers* with the pedicels 1.5–3.0 mm long, glabrous; hypanthium 0.5–1.2 mm long, smooth, glabrous, the calycine cup and teeth to 2.5 mm long, the cup with a few appressed glands, coriaceous, the teeth 4, subulate, to 0.7 mm long; corolla white, the tube narrowly cylindrical, to 9 mm long, ca. 2 mm wide, glabrous, stiffly petaloid, the lobes 4, lanceolate, to 7.5 mm long, tapering narrowly toward the apex; stamens 4, the anthers narrowly oblong, 4–5 mm long, ca. 0.5 mm wide, obtuse, caudate at the base, dorsifixed, the filaments ca. 1 mm long, attached near the middle or at the upper ⅓ of the tube; stigmas 2, subulate, to 2.2 mm long, the style 10–13 mm long. *Fruits* scarcely pedicellate, oblong, to 1.7 cm long, ca. 1 cm wide, smooth, glabrous, white, drying yellow, spongy within, the persistent calycine cup small, to 1.5 mm long, ca. 1 mm wide.

Coussarea loftonii is known only from Panama. It was originally described from flowering material, but a recent collection, *Lewis & Dressler 6567*, has fruits which are obviously those of a *Coussarea* and not of *Faramea*. *Nee 9297* describes the flowers as very fragrant.

COLÓN: Santa Rita Ridge, *Correa & Dressler 667* (MO); *Dressler 3852* (MO). Santa Rita Ridge Road, *Gentry et al. 8864* (MO). El Llano-Cartí road 9.6–11 km from Interamerican Highway, *Mori & Kallunki 3521* (MO). Santa Rita Ridge Road, 14 km from the Boyd-Roosevelt Highway, *Mori & Kallunki 4904* (MO). PANAMÁ: La Eneida, Lopez House, *Correa & Dressler 818* (MO). Cerro Jefe, *Lewis & Dressler 7567* (MO). NE of town of Cerro Azul, *Mori & Kallunki 3641, 3649* (both MO); *NEE 9297* Cerro Jefe, *Tyson et al. 3323* (MO); *Wilbur & Weaver 11373* (MO).

9. **Coussarea morii** Dwyer.[33] TYPE: Panamá, *Mori 7058* (MO, holotype).

Trees to 12 ft tall, ca. 20 cm d.b.h., the twiglets slender, smooth, glabrous, the nodes well spaced. *Leaves* oblong, 10.0–24.5 cm long, 3.5–12.0 cm wide, obtuse to widely cuneate at the apex, acuminate, the acumen to 1.5 cm long, falcate, acute to obtuse at the base, the costa subplane above, subprominent beneath, the lateral veins 7–10, arcuate, prominulous beneath, the submarginal undulate vein vague, the intervenal areas patulous reticulate, thin chartaceous, scarcely discolorous, drying green, glabrous except for tufts of hairs in the axils of most veins; petioles 1.5–2.0 cm long, rigid, strict, glabrous, drying dark; stipules not seen; glands at stipular scar position numerous, narrow oblong, ca. 1 mm long, drying red. *Inflorescences* terminal and axillary, cymose paniculate, to 19 cm long, to 6 cm wide; peduncle ca. 3 cm long, ca. 0.3 cm wide, angular and compressed, drying black, glabrous; primary branches disposed as 3–4 pairs, opposite or subopposite, well spaced, often at right angles to the rachis, the lowermost to 2.5 cm long; cymes few, clustered at the tips of reduced secondary branches; bracts and bracteoles apparently absent except for 2 mammiform swellings in the axils of the uppermost leaves, 1 per axil, ca. 1 mm long, glabrous, drying black. *Flowers* sessile or subsessile, externally glabrous; hypanthium to 2 mm long, the calycine cup and hypanthium chalicelike, the cup ca. 2 mm long, turgid, petaloid, the teeth as vague points or distinctly 5, oblong, to 1 mm long, obtuse, the cup with a few appressed glandular spots within; corolla white, the tube narrow cylindrical to 5 mm long, to 1.3 mm wide in the middle, flaring at the very base; stamens 4, the lobes 4, oblong, slightly longer than the tube, to 8 mm long, the anthers narrow oblong, ca. 4 mm long, exserted, the filaments to 2 mm long, attached below the mouth; style slender, to 6.5 mm long, glabrous, the stigmas digitiform, to 1 mm long, as wide as the style; ovules 2, connate. *Fruits* not known.

Coussarea morii is known only from Panama. It is named in honor of Scott Alan Mori, distinguished student of tropical American plants. The new species is closely allied to *C. paniculata* (Vahl) Standley, but differs in having both

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[33] *Coussarea morii* Dwyer, spec. nov. *Arbores* ramulis glabris. *Folia* oblonga, 10.0–24.5 cm longa, 3.5–12.0 cm lata, apice obtusa vel lato-cuneata, acumine ad 1.5 cm longo, venis lateralibus 7–10, tenui-coriacea glabra; petiolis 1.5–2.0 cm longis. *Inflorescentiae* terminales et axillares, cymoso-paniculatae, ad 19 cm longae, ad 6 cm latae, pedunculo ca. 3 cm longo glabro ramis primariis in jugis 3–4 dispositis. *Flores* sessiles vel subsessiles hypanthio ca. 2 mm longo glabro cupula calycis ca. 2 mm longa, turgida petaloidea dentibus saepe inconspicuis vel aliter ad 1 mm longis, obtusis glabris; corolla tubo cylindrico, ca. 5 mm longo, leviter curvato extus glabro intus villosuloso supra medium; antheris 4 angusto-oblongis, ca. 4 mm longis exsertis filamentis ad 2 mm longis infra faucem affixis; stigmatibus digitiformibus, ad 1 cm longis. *Fructus* not visi.

terminal and axillary inflorescences which are often twice the length of those of *C. paniculata*; usually a single small mammiform swelling in the axils of the uppermost leaves subtending the peduncle; thin chartaceous rather than coriaceous leaves; glabrous hypanthium with the calycine cup glabrous and occasionally with teeth to 1 mm long; corolla with oblong lobes which measure about 2 mm in diameter. Dr. Mori records that the tree is 12 meters in height. Apparently *C. paniculata* does not exceed 8 meters in height (fide Steyermark, 1974).

DARIÉN: Río Tuquesa, at middle Tuqesa Mining Company Camp called Charco Peje, tropical wet forest, 250 m, *Mori 7058* (MO).

10. **Coussarea nebulosa** Dwyer.[34] TYPE: Panamá, *Croat 15868* (MO, holotype).

Shrubs 3.0–3.5 m tall, the twigs smooth, dark grey when dry, often rimose, the nodes swollen, well spaced. *Leaves* oblong, 6.0–10.5 cm long, 2.5–3.5 cm wide, acute toward the apex, acuminate, the acumen narrowly deltoid, to 1 cm long, the costa plane or prominulous above, prominulous beneath, the lateral veins 5–6, arcuate, extending to the margin, subchartaceous, somewhat discolorous, glabrous, the raphides minute, white, dense; petioles slender, to 1.2 cm long, ca. 0.13 cm wide; stipules connate, the sheath slightly turgid, ca. 2 mm long, each part of the sheath with 2 well-spaced awns shorter than the sheath. *Inflorescences* terminal, solitary, glabrous, to 5 cm long, to 3 cm wide, the peduncle to 2.5 cm long, the lowermost branches opposite, to 1.5 cm long, the upper branches few; lowermost bracts subulate, to 3 mm long. *Flowers* sessile; hypanthium subrotund, ca. 0.6 mm long, the calycine cup glabrous, 0.5 mm long, lacking glands within, the teeth 5, triangular, 0.5 mm long; corolla white, ca. 25 mm long, the tube ca. 18 mm long, carnose, glabrous outside, villose inside, the lobes 5–6 mm long; stamens 5, the anthers linear oblong, 4 mm long, 0.35 mm wide, the filaments ca. 0.5 mm long, the style 19 mm long, ca. 0.3 mm wide, the stigmas 2, ca. 2 mm long. *Fruits* not seen.

Coussarea nebulosa is known only from Panama. The new species has the fewest lateral veins (5–6) among the Panamanian *Coussarea*; its connate stipules, each part with 2 short awns, are unique among the Panama *Coussarea*. The type was collected near Boquete at about 4,000 ft elevation. This is probably the highest elevation at which a Panamanian *Coussarea* has been collected. The specific name "nebulosa" was selected as it suggests a cloud forest.

CHIRIQUÍ: Uncut cloud forest at Monte Rey near Boquete, *Croat 15868* (MO).

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[34] *Coussarea nebulosa* Dwyer, spec. nov. *Frutices* 3.0–3.5 m alti. *Folia* oblonga, 6.0–10.5 cm longa, 2.5–3.5 cm lata, versus apicem acuta, acumine ad 1 cm longo venis lateralibus 5–6 subchartacea glabra; petiolis ad 1.2 cm longis; stipulis connatis vagina subturgida, ca. 2 mm longis, parte utraque setis duabus quam vaginam brevioribus. *Inflorescentiae* terminales solitarieae glabrae, 5 cm longae, ad 3 cm latae, pedunculo ad 2.5 cm longo. *Flores* cupula calycis 0.5 mm longa, glabra eglandulosa dentibus 5, 0.5 mm longis; corolla alba tubo ca. 18 mm longo, intus villoso, lobis 5–6 mm longis; staminibus 5, antheris lineari-oblongis, 4 mm longis, filamentis ca. 0.5 mm longis. *Fructus* non visi.

11. **Coussarea neei** Dwyer.[35] TYPE: Panamá, *Nee 9820* (MO, holotype).

Trees or shrubs, 4–7 m tall, the twigs leafless except at tips, gray, cracking, often flexuous, the nodes turgid. *Leaves* lanceolate or oblong-lanceolate, often inequilateral and falcate, 5–16 cm long, 1.8–5.0 cm wide, acute, obtuse or rounded at the apex, the acumen absent or conspicuous, to 1 cm long, acute to obtuse at the base, the costa immersed above, prominulous or subprominent beneath, the lateral veins 9–10, often widely arcuate, the intervenal areas spreading reticulate, thin papyraceous, discolorous, often drying brown, arachnoid pubescent only on the costa above, pubescent on the costa beneath, occasionally on the veins; petioles to 2.5 cm long, 1.3 cm wide; stipules free, compressed rotund, to 0.4 cm long, rotund at the apex, smooth, glabrous, ciliolate marginally. *Inflorescences* terminal, solitary, ferrugineous villose or hirsute, 2.5–8.0 cm long, 2.5–9.0 cm wide, the peduncle reduced, 0.5–0.8 cm long, ca. 1 mm wide, the branches 2, opposite, the cymules terminal, the flowers few. *Flowers* (in bud), with the hypanthium oblong, to 3 mm long, ferrugineous hirsute, the calycine cup ca. 2 mm long, subcarnose, villosulose within, the lobes 4–5, subulate, often scarcely inequilateral, to 3 mm long, erect, densely golden villose. *Fruits* sessile, narrowly oblong, to 2.7 cm long, to 0.8 cm wide, drying black, densely golden puberulent.

Coussarea neei is known only from Panama. It is named in honor of Michael Nee, who collected extensively in Panama in 1973–1974. It is closely related to *Coussarea enneantha* Standley, as is evident from the structure of the inflorescence. The new species has a much shorter calycine cup with conspicuous calycine teeth.

DARIÉN: Serrania de Pirre, ascent of Serrania de Pirre above Caná gold mine, 600–1000 m, *Croat 37737* (MO). VERAGUAS: Valley Río Dos Bocas, between Escuela Agricola Alto Piedra and Calovébora, 15.6 km NW of Santa Fé, 450–550 m, *Croat 27649* (MO). 5 mi NW of Sant Fé, above Río Primero Brazo, *Liesner 823* (MO). 8.8 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3216* (MO). 6–7 km W of Santa Fé, new road past agricultural school, 2900 ft, *Nee 9708* (MO), *9820* (MO, holotype).

12. **Coussarea paniculata** (Vahl) Standley, J. Wash. Acad. Sci. 18: 282. 1928.

Froelichia paniculata Vahl, Ecol. Amer. 3. 1796. not Moench. 1794. TYPE: French Guiana, not seen.
Billardieria paniculata Vahl, Ecol. Amer. 10. 1796. TYPE: French Guiana, "In sylvis prope amnem Galibiensem," not seen.
Faramea martini DC. ex Griseb., Fl. Brit. W. I. 339. 1861, not DC. 1830. TYPE: French Guiana, not seen; photo in Delessert Herb. (F).
Coussarea froelichia A. Rich., Mém. Soc. Hist. Nat. Paris 5: 177. 1834. TYPE: not seen.
C. darienensis Steyermark, Ceiba 3: 20. 1952. TYPE: Panamá, *Allen 4576* (F, holotype; isotype, NY).

Small *trees*. *Leaves* widely elliptic, 8.5–14.0 cm long, 3–6 cm wide, caudate acuminate at the apex, the acumen to 1.8 cm long, cuneate, acute, often attenuate

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[35] *Coussarea neei* Dwyer, spec. nov. *Arbores* vel frutices, 4–7 m altae. *Folia* lanceolata vel oblongo-lanceolata, saepe inaequilateralia et falcata, 5–16 cm longa, 1.8–5.0 cm lata, venis lateralibus 9–10, tenui-papyracea supra in costa solum arachnoideo-pubescentia subtus in costa et saepe in venis pubescentia; petiolis ad 2.5 cm longis; stipulis compresso-rotundis, ad 0.4 cm longis, apice rotundis. *Inflorescentiae* terminales solitariae ferrugineo-villosae vel hirsutae, 2.5–8.0 cm longae, 2.5–9.0 cm latae, pedunculo 0.5–0.8 cm longo, ca. 1 mm lato, ramis 2 oppositis dispositis cymulis terminalibus paucos flores ferentibus. *Flores* cupula calycis ca. 2 mm longa, lobis 4–5, ad 3 mm longis. *Fructus* sessiles angusto-oblongi, ao 2.7 cm longi, ca. 0.8 cm lati, in sicco nigri dense aureo-puberuli.

at the base, the lateral veins ca. 8, stiffly chartaceous, discolorous or concolorous, glabrous except for a few hairs in the axils of the veins below; petioles to 1.5 cm long; stipules often deciduous. *Inflorescences* pyramidal paniculate, 6.5–9.0 cm long, to 6 cm wide, the peduncle to 1.5 cm long, the branches few, paired, perpendicular to the rachis, the lowermost to 2.5 cm long. *Flowers* subsessile or on pedicels to 0.5 cm long; calycine cup glabrous, turgid, to 1 mm long, smooth, the teeth scarcely measurable; corolla white, the tube to 3 mm long, the lobes ca. 6.5 mm long; anthers linear, to 5 mm long, the filaments to 1 mm long attached near the mouth. *Fruits* on pedicels to 0.5 cm long, ovoid, 1.2–1.6 cm long, 1.0–1.5 cm wide, yellow, white or green, glabrous, drying black.

Coussarea paniculata is known from Panama, Trinidad and northern South America. The isotype of *C. darienensis* is deposited in NY, not in the Missouri Botanical Garden herbarium, contrary to Steyermark's indication in the original description.

DARIÉN: Río Chico, Yaviza, ca. 100 ft, *Allen 4576* (F, NY). Puerto St. Dorothea, near Colombia-Panamá border on Pacific side, *Dwyer 2222* (MO).

13. **Coussarea roseo-cremea** Dwyer.[36] TYPE: Panamá, *Dressler 4334* (MO).

Shrubs to 3 m tall, the branchlets ultimately obtusely angular, smooth, glabrous, the lenticels minute, few. *Leaves* oblong, 6.5–13.0 cm long, 3.5–7.0 cm wide, obtuse, rotund or widely deltoid at the apex, rounded or obtuse at the base, acuminate, the acumen short, to 0.5 cm long, acute or obtuse, the costa prominulous above and beneath, the lateral veins 7–8, widely arcuate, forming an undulate submarginal vein, the intermediate veins 1–4, soon branching; petioles moderately slender, stiff, glabrous, 1.0–2.5 cm long, to 0.12 cm wide; stipules often short connate, persistent, hemispherical, turgid, to 0.4 cm long, each part with 2 awns. *Inflorescences* solitary, terminal, cymose paniculate, to 6.5 cm long, to 5.5 cm wide, the peduncle to 2.5 cm long, the lowermost branches few, 1–3, opposite or verticillate, to 3 cm long, the flowers terminal, few. *Flowers* sessile; hypanthium subrotund, ca. 1 mm long, shiny, glabrous, the calycine cup to 0.5 mm long, subturgid, petaloid, glabrous, eglandular within; corolla pink, the tube narrow cylindrical, ca. 15 mm long, wider above the middle, puberulent inside and out, petaloid, the lobes 5, linear subulate, ca. 10 mm long, 1 mm wide at base, the margins contiguous above the middle, flat, venose near the mouth, petaloid; stamens 5, the anthers narrowly oblong, 3.3 mm long, subacute, not exserted, the filaments short, 1.1 mm long, attached above the middle of the tube; ovarian disc 0.4 mm long, 0.9 mm wide, the style slender, 15 mm long, the stigmas 2, subulate, 1.5 mm long. *Fruits* not seen.

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[36] *Coussarea roseo-cremea* Dwyer, spec. nov. *Frutices* ad 3 m alti. *Folia* oblonga, 6.5–13 cm longa, 3.5–7 cm lata, apice obtusa, rotundata vel lato-deltoidea, acumine ad 0.5 cm longo, basi rotundata vel obtusa venis lateralibus 7–8; petiolis 1–2.5 cm longis; stipulis saepe brevi-connatis, persistentibus hemisphaericis turgidis ad 0.4 cm longis parte utraque aristis duabus praedita. *Inflorescentiae* solitariae terminales cymoso-paniculatae, ad 6.5 cm longae, ad 5.5 cm latae, pedunculo ad 2.5 cm longo, floribus terminalibus paucis. *Flores* cupula calycis ad 0.5 mm longa, dentibus nullis; corolla roseo-cremea, tubo ca. 15 mm longo, lobis 5 lineari-subulatis ca. 10 mm longis; antheris angusto-oblongis, 3.3 mm longis, filamentis 1.1 mm longis. *Fructus* non visi.

Coussarea roseo-cremea is known only from the single collection in Panama. It is closely related to *Coussarea nebulosa* Dwyer which also has connate stipules with awns, few lateral veins in the leaf blades and a very reduced calycine cup. *Coussarea roseo-cremea,* however, is a lowland species with pink flowers, smaller anthers and corolla lobes almost equal to the corolla tube in length. The Latin name roseo-cremea refers to the flower color.

PANAMÁ: El Llano-Cartí Road, 6–10 km N of El Llano, *Dressler 4334* (MO).

14. **Coussarea veraguensis** Dwyer.[37] TYPE: Panamá, *Mori & Kallunki 4800* (MO, holotype).

Trees to 4 m tall, the branchlets rigid, angular, glabrous, sharply ascending, the nodes well spaced, somewhat turgid. *Leaves* narrowly or widely elliptic, often slightly falcate, rarely inequilateral, 14–20 cm long, 3.5–10.0 cm wide, deltoid toward the apex, acuminate, the acumen to 2 cm long, often ultimately acute, cuneate or obtuse at the base, the lateral veins 11–14, arcuate, disappearing toward the margin, the intervenal areas reticulate, the raphides minute, white, rigidly membranous, concolorous, glabrous or puberulent below on the costa and veins; petioles thick, 0.5–1.0 cm long, to 0.25 cm wide, puberulent; stipules deciduous, not seen. *Inflorescences* terminal, racemelike, to 5 cm long, to 3 cm wide, the peduncle slender, 1–2 cm long, subtended by 2 large leaflike bracts 2.0–5.5 cm long, 0.8–1.5 cm wide, each bract with an erect linear-oblong process in the axil, to 0.4 mm long, obtuse, black, glabrous, the flowers 15–20, either solitary on the rachis or in 2–3 sessile clusters. *Flowers* with the pedicels short, 1–3 mm long, glabrous; hypanthium oblong, ca. 2 mm long, glabrate, the calycine cup cupuliform, somewhat turgid, to 0.6 mm long, minutely puberulent only on the margin, inside with 10 rotund glands of various size, dark red; corolla white, the tube narrowly cylindrical, ca. 7 mm long, 1.5 mm wide, subfalcate in the bud, narrow toward the base, carnose, glabrous, the lobes 4, carnose, narrowly oblong, to 5 mm long, stamens 4, the anthers narrowly rectangular, ca. 4 mm long, obtuse, sagittate at the base, the filaments arising near the middle of the tube; disc of the ovary compressed rotund, to 0.8 mm long, the style plane compressed, ca. 5 mm long, the stigmas 2, fingerlike, to 2 mm long. *Fruit* not seen.

Coussarea veraguensis is known only from Panama. It is distinguished by its racemelike inflorescence in which the flowers arise either in solitary fashion or are disposed as clusters on 2 or 3 reduced branches of the rachis. The 2 large

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[37] *Coussarea veraguensis* Dwyer, spec. nov. *Arbores* ad 4 m altae. *Folia* angusto- et lato-elliptica, 14–20 cm longa, 3.5–10 cm lata, versus apicem deltoidea acumine ad 2 cm longo, plerumque ultime acuto, basi cuneata vel obtusa venis lateralibus 11–14, rigido-membranacea, glabra vel puberula; petiolis 0.5–1 cm longis. *Inflorescentiae* terminales racemo similes, ad 5 cm longae, ad 3 cm latae, pedunculo gracili, 1–2 cm longo, bracteis basi pedunculi 2 magnis foliis similibus, 2–5.5 cm longis, floribus 15–20 solitariis in rhachidi vel 2–3 fasciculis sessilibus dispositis. *Flores* pedicellis 1–3 mm longis; cupula calycis cupuliformi, ad 0.6 mm longo, solum in margine minuto-puberula intus decem glandulis rotundis praedita; corolla alba; tubo angusto-cylindrico, ad 7 mm longo, glabro, lobis 4, ad 5 mm longis; staminibus 4, antheris angusto-rectangularibus ca. 4 mm longis. *Fructus* non visi.

leaflike bracts have a distinct oblong process at the base; the corolla tube appears to be shortest (only 7 mm long) among the Panamanian *Coussarea* except for *C. villosula*.

Coussarea veraguensis appears to be closely related to *C. carolina* Standley, a Costa Rican species, and to *C. paniculata* (Vahl) Standley, which occurs in Panama and in Costa Rica.

VERAGUAS: NW of Santa Fé, 1 km from Escuela Agricola Alto de Piedra, on the slopes of Cerro Tute, *Mori & Kallunki 4800* (MO).

15. **Coussarea villosula** Dwyer, Ann. Missouri Bot. Gard. 53: 105. 1966. TYPE: Panamá, *Duke 5338* (MO, holotype).

Small *trees*, the branchlets terete, nodose, minutely puberulent. *Leaves* lanceolate, to 20 cm long, to 8 cm wide, acuminate at the apex, acute basally, the lateral veins ca. 15, ca. 1 cm apart, the costa prominulous above, prominent proximally beneath, the margin delicately revolute, rigidly papyraceous, glabrous above, sparsely villosulose and conspicuously reticulate beneath; petioles 1–4 cm long, somewhat thick, puberulent; stipules triangular, to 8 mm long, hirsute. *Inflorescences* terminal, 2–4 cm long, narrow, to 2.5 cm wide, densely sericeous villose; peduncle slender, 2–3 cm long, the cymules 3–4-flowered; bracts subulate, to 2 mm long. *Flowers* with the buds fusiform, to 0.5 cm long; calycine cup bell shaped, to 2.5 mm long, ca. 1.6 mm wide, carnose, densely appressed villose outside, the hairs to 0.8 mm long, the teeth 5, scarcely measurable or to 0.5 mm long; corolla white, the tube about 3.2 mm long, densely appressed villose outside, glabrous within, carnose, the lobes 5, imbricate, ca. 1 mm long, falcate and obtuse at the apex; anthers subsessile, somewhat wedge shaped, to 1.3 mm long; style slender, to 1 mm long; stigmas small; ovules 2, brown when dry, separated by a thin septum. *Fruits* not seen.

Coussarea villosula is known only from Panama. Its spindle shaped buds and greatly contracted hairy inflorescence readily distinguish it.

COCLÉ: El Valle from village to La Mesa, ca. 2000 ft, *Dwyer & Correa 7925* (MO). DARIÉN: Cerro Pirre, from Río Pirre S to El Real, 750–1030, *Duke 5338* (MO).

26. COUTAREA

Coutarea Aubl., Hist. Pl. Guiane 314. 1775. TYPE: C. speciosa Aubl.

Shrubs or small trees. *Leaves* membranous, glabrate, petiolate; stipules short, acute. *Inflorescences* terminal or axillary, cymose, the flowers occasionally solitary (not Panama). *Flowers* with the calyx 5–8-lobed, deciduous in fruit; corolla funnel shaped or campanulate, the tube asymmetric, curved, gibbous ventricose, the lobes 5–8, short, plicate imbricate; anthers exserted, the filaments free, not attached to the corolla tube; ovules numerous, the ovary 2-celled. *Fruits* capsular, compressed oval, usually coriaceous and conspicuously lenticellate, dehiscing longitudinally; seeds broadly winged.

Coutarea ranges from Mexico to Argentina, with about 7 species in the genus. I have some doubts as to whether this genus belongs in the Rubiaceae. The unique

corolla shape, the staminal filaments being free of the corolla tube, and the unsusal shape of the fruit are the principal characters which render the genus suspect.

1. **Coutarea hexandra** (Jacq.) K. Schum. in Mart., Fl. Bras. 6(6): 196. 1889.

Portlandia hexandra Jacq., Enum. Pl. Carib. 16. 1760. TYPE: Colombia, *Cartagena*, not seen.
Coutarea flavescens Moc. & Ses., DC., Prodr. 4: 350. 1830. TYPE: not seen.
C. hexandra pubescens K. Schum. in Mart., Fl. Bras. 6(6): 198. 1889. TYPE: not designated.

Small *trees* or shrubs, the twiglets terete, glabrous, relatively smooth, the lenticels often abundant and conspicuous, the branchlets rigid or subarcuate, the nodes usually well spaced. *Leaves* usually ovate rotund to ovate, 4–12 cm long, 2–6 cm wide, round or occasionally deltoid at the apex, acuminate, the acumen short, subfalcate, acute or more often acuminate, basally rounded, obtuse or truncate, often vaguely inequilateral, the venation immersed or prominulous above, prominulous beneath, the costa slender, the lateral veins 6–12, scarcely arcuate, well spaced, stiffly papyraceous, glabrous above, glabrous to golden pubescent beneath, the hairs curled, scattered along the veins, often tufted in the axils; petioles short, to 1.5 cm long, glabrous or often golden villulose; stipules soon deciduous, widely triangular or compressed hemispherical, 2–4 mm long, acute. *Inflorescences* terminal and axillary, glabrate or minutely puberulent, the peduncle absent or short, the branches 3–5, often lenticellate, terminated usually by 3-flowered cymules or to single flowers; bracteoles linear subulate or ovate subulate, several located at the base of the pedicel; bracts lanceolate or subulate; pedicels short. *Flowers* large, showy, hypanthium oblong rotund or oblong, ca. 6 mm long, smooth, puberulent, the calycine cup ca. 1.5 mm long, glabrous within, with patches of oblong glands at the junction of the calycine lobes, these ca. 0.75 mm long, obtuse, the lobes 4–6, subulate, ca. 5.5 mm long, obtuse, marginally pubescent; corolla obovate oblong, slightly falcate and thus zygomorphic, to 8 cm long, 1.8–3.0 cm wide, obtuse at the apex, attenuate acute at the base, petaloid, scattered pubescent outside, puberulent within, the lobes 2.0–2.5 cm long, obtuse or acute; stamens 6, the anthers linear oblong, 1.7–2.2 cm long, ca. 1.5 mm wide, sagittate at the base, basifixed, the filaments free of the corolla tube, ca. 7.5 cm long; style linear, 7.5–9.5 cm long, ca. 1.5 mm wide, the stigmas 1.2–1.7 cm long, scarcely wider than the style, the ovary wall oblong in cross section, with conspicuous ducts. *Fruits* capsular, oblong obovoid or obovoid rotund, 2.5–5.0(–7.0) cm long, 2.0–2.8 cm wide, strongly compressed, lignose, bisculcate, dark brown, lustrous, glabrous, with numerous white, punctate lenticels; seeds round or oblong, 2–15 mm long, brown, the body 2–5 mm long, alate, the wing membranous, entire or undulate.

Coutarea hexandra is a common tree or shrub in the American tropics extending from Mexico to Argentina. The fruits of *Mori et al. 4097A* are noteworthy being ca. 3 times longer than wide, the longest to 7 cm long. Dr. Thomas Croat (pers. comm.) notes that the flowers are bat pollinated. "Niño Muerto"; "Quina."

BARRO COLORADO ISLAND: *Aviles X-5* (MO); *Croat 5165, 7354, 8700* (all MO); *Foster 1074* (MO); *Gentry 1988* (MO); *Zetek 3904* (MO). CANAL ZONE: Pipeline Road, *Croat 16683* (MO). Fort Amador, *D'Arcy 9264* (MO). Island beyond Fort Amador, *D'Arcy & D'Arcy 6119* (MO). Ft. Kobbe, *Duke*

4257 (MO). Farfan Beach, *Dwyer 3067* (MO); *Dwyer et al. 457* (MO); *Dwyer et al. 4693* (MO, SCZ). Madden Dam, *Dwyer & Hayden 10* (MO). Farfan Beach, *Dwyer & Hayden 7524* (COL, DUKE, K, MO, UC). Pipeline Road, *Gentry 1447* (MO). Farfan Beach, *Gentry 5501* (MO). Ancón Hill, *Holdridge 6534b* (MO). Farfan Beach, *Lewis et al.* (GH, K, MO, NY, UC, US); *Tyson 1814* (MO). CHIRIQUÍ: San Félix to Cerro Flor, *Allen 1953* (MO). COCLÉ: Nueva Gorgona, *D'Arcy & D'Arcy 6283* (MO). 5 mi S of Antón, *Tyson & Blum 2572* (MO). La Vinta, *Woodson et al. 1706* (MO). COLÓN: 4 km NW of Salamanca, 13 km NE of Buenos Aires, *Nee 9067* (MO). DARIÉN: Río Tuqueza below Quebrada Venado, *Bristan 1078* (MO). Isla Saboga, *Duke 10357* (MO). Punta Garachine, *Duke 10490* (MO). 1–4 mi N of Pucro, *Duke 13028* (MO). Trail, Río Pucro to Quebrada Maskia, *Duke 13071* (MO). HERRERA: Pese, *Allen 796* (MO). PANAMÁ: Burunga, *Austin 28* (MO). Morro Island, *D'Arcy & D'Arcy 6785, 6786* (both MO). Nueva Gorgona, *Duke 4532* (MO). E of Bejuco, *Duke 4548* (MO). El Llano, *Duke 5864* (MO). Taboga Island, *Dwyer 2807, 3067* (both MO). Cerro Azul, *Gentry & Dwyer 5508* (MO). Juan Díaz, *Hunter 252* (MO). Playa de Venado, *Mejia 2* (MO). 6 mi SW of Arraijan, road to Bique, *Nee 6898* (MO). Las Sabanas, *Pittier 6757* (MO). Nuevo Emperador, vicinity of Arraijan, *Rivas de Hoyos 6* (MO). N of Chorrea, *Tyson 5936* (MO). S of La Capitana, *Tyson 6765* (MO). Chepo. *Tyson 6776* (MO). Arraíjan, *Woodson et al. 1386* (MO). Isla Taboga, *Woodson et al. 1495* (MO). Pacora and Chepo, *Woodson et al. 1668* (MO).

27. CRUSEA

Crusea Cham. & Schlecht., Linnaea 5: 165. 1830. TYPE: *C. rubra* (Jacq.) Cham. & Schlecht.

Herbs, often perennial, the stems usually 4-angled. *Leaves* mostly lanceolate, the lateral nerves conspicuous; petioles adnate to the stipular sheath, the latter setiferous. *Inflorescences* capitate, surrounded by foliaceous bracts. *Flowers* with the 4 calycine lobes alternating with minute glands, the calyx persistent in fruit; corolla funnelform, glabrous within, the 4 lobes valvate; ovary 2-celled, the ovules 1 per locule. *Fruits* capsular, didymous, the mericarps or cocci indehiscent, thin, the endocarp transparent, smooth, ecostate, the ventral face grooved, narrow, the flanks of endosperm folded against the deep hilar ridge, the seeds 1 per locule, the testa cells contorted.

The genus *Crusea*, according to Anderson (1972), extends from "Southern Arizona and New Mexico through Mexico and Central America to northern Panama."

Literature:

Anderson, W. R. 1972. A monograph of the genus *Crusea* (Rubiaceae). Mem. N.Y. Bot. Garden 22(4): 128.

a. Corolla red, rose or violet; calycine cup 3–4 mm long; anthers ca. 3 mm long ..... 1. *C. coccinea* var. *chiriquiensis*

aa. Corolla white; calycine cup less than 1 mm long; anthers ca. 1 mm long ..... 2. *C. longiflora*

1. **Crusea coccinea** DC., Prodr. 4: 567. 1830. TYPE: *Pavón*, not seen.—Fig. 30.

1a. **Crusea coccinea** DC. var. **chiriquiensis** W. R. Anderson, Mem. N.Y. Bot. Garden 22: 45. 1972. TYPE: Panamá, *Woodson & Schery 358* (F, holotype; GH, MO, isotypes).

Upright or creeping *herbs*, stems angular, ribbed, glabrous, drying purple. *Leaves* oblong or ovate oblong, 1.5–6.0 cm long, 0.5–2.0 cm wide, acute at the

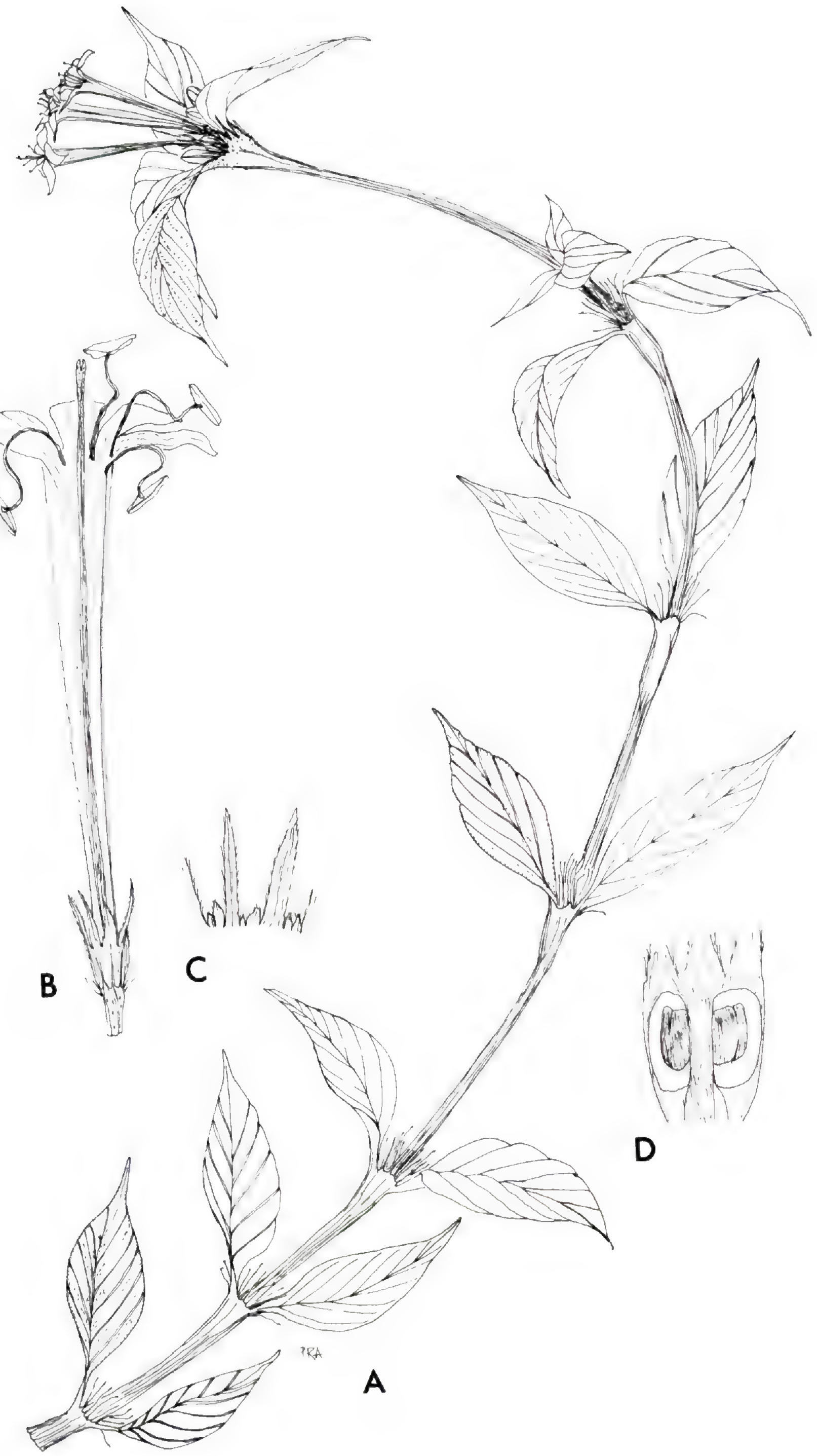

FIGURE 30. *Crusea coccinea* var. *chiriquiensis* W. R. Anders.—A. Habit (×½).—B. Flower (×1.55).—C. Calyx (×3.5).—D. Ovary in longisection (×3.5). [After *D'Arcy & D'Arcy 6519.*]

apex, occasionally distinctly acuminate, the acumen to 1.2 cm long, basally cuneate to acute, often slightly decurrent on the petioles, the costa slender, often indistinguishable from the lateral veins, plane or immersed above, prominent beneath, to 0.7 mm wide, the lateral veins usually 5, strongly arcuate ascending, arising at a sharp angle, immersed or plane above, prominent beneath, chartaceous, not strongly discolorous, the upper surface striate, white hirtellous between the veins, white hirtellous beneath; petioles 0.5–0.8 cm long, to 0.1 cm wide, these adnate to the lip of the stipular cup; stipules cylindriform, to 1.5 cm long, to 0.5 cm wide, membranous, glabrous or occasionally villosulose, the sheath extending beyond the next superior node, with a terminal fringe of 1–12 glandular tipped linear setae, often hirtellous, to 1.4 mm long, ca. 0.2(–0.5) mm wide. *Inflorescences* terminal, sessile, the flowers several, ascending, the hypanthiums hidden by the terminal stipules and the leaf bases. *Flowers* with the hypanthium turbinate, 3–5 mm long, ca. 2 mm wide at the truncate apex, the calycine cup cupuliform or campanulate, 3–4 mm long, ca. 3 mm wide at the apex, glabrous, petaloid, the lobes 4, unequal, lanceolate, to 8 mm long, ca. 1.2 mm wide at the base, acute, glabrous except hirsute marginally, usually with 2–3 small glands at the junction of 2 adjacent lobes, oblong, to 1 mm long, obtuse; corolla red, rose or violet, to 35 mm long, the tube narrowly funnel shaped, sharply attenuate below middle, to 0.3 cm wide near the mouth, glabrous within and outside, the lobes 4, elliptic or ovate oblong, 8–11 mm long, to 5 mm wide, with a few white hairs abaxially and terminally; stamens 4, exserted, the anthers oblong, ca. 3 mm long, twisted after shedding pollen, versatile, the filaments slender, plane, equal to the corolla lobes, to 7 mm long, attached near the mouth; style filamentous, as long as the corolla tube, minutely puberulent on the upper ⅓, the stigmas 2, slender, ca. 1.8 mm long. *Fruits* not seen.

Crusea coccinea var. *chiriquiensis* is known from Costa Rica and Panama. *Croat 15956*, with only flower buds, is described on the label as "white."

CHIRIQUÍ: Río Chiriquí Viéjo Valley, *Allen 1369* (MO). Cerro Punta, *Blum et al. 2426* (MO). NW side of Cerro Pando cloud forest, *Croat 15956* (MO). Cerro Respinga above Cerro Punta, *D'Arcy 10709* (MO); *D'Arcy & D'Arcy 6519* (MO). Cerro Punta, *Ridgway & Solis 2391* (MO, UC). Río Chiriquí Viéjo, Monte Lirio, *Seibert 220* (MO). Casita Alta to Cerro Copete, *Woodson & Schery 358* (MO).

2. **Crusea longiflora** (R. & S.) Anderson, Mem. New York Bot. Gard. 22: 89. 1972.

Spermacoce longiflora Willd. ex R. & S., Syst. Veg. 3: 531. 1818. TYPE: México, Humboldt & Bonpland (B-Willd., not seen).
Crusea brachyphylla Schlecht. & Cham., Linnaea 5: 165. 1830. TYPE: *Schiede & Deppe 532b* (F, isotype).
Spermacoce tenuiflora Ses. & Moc., Fl. Mex. 24. 1893. TYPE: not seen.
Crusea chiapensis Brandegee, Univ. Cal. Publ. Bot. 6: 374. 1917. TYPE: México, *Purpus 7526*, not seen.
Crusea brachyphylla fo. *microcephala* Loes., Verh. Bot. Vereins Prov. Brandenburg 65: 115. 1923. TYPE: *Seler & Seler 1211*, not seen.

Herbs to *subshrubs*, 0.5–50.0 cm tall, branched or unbranched, the stems slender, the hairs appressed, deflexed, the nodes well spaced. *Leaves* sessile, lanceolate, occasionally ovate oblong, 0.5–3.0 cm long, 0.2–0.6 cm wide, acute or deltoid at the apex, acute at the base, the costa slender, plane or immersed

above, prominulous beneath, the lateral veins (1–)2–5, strongly arcuate ascending, without a submarginal undulate vein, the intervenal areas smooth, the veinlets not evident, chartaceous to thinly succulent, concolorous, the hairs above strigose, appressed, golden colored or white, subulate, 0.2–0.7 mm long, the hairs beneath as above but mostly on costa and veins, the margin somewhat thick, minutely ciliolate or with short, thick, ascending hairs; stipules to 4 mm long, truncate, the setae 3–5, erect, the hairs stiff, to 1.7 mm long. *Inflorescences* terminal, 0.5–4.0 cm in diam., the uppermost leaves involucrate, the stem immediately below the involucre of leaves with numerous, weak, reflexed hairs. *Flowers* subsessile, the hypanthium oblong, shorter than the calyx, minutely puberulent; calycine cup 0.2–0.5 mm long, the lobes 4, subulate, erect, slightly spreading, 1.6–3.2 mm long, usually slightly unequal, the hairs slender, stiff, to 0.8 mm long, with a minute gland in the sinus of 2 adjacent lobes; corolla white, the tube slender, 0.6–0.7 cm long, ca. 0.2 mm wide, minutely puberulent to glabrous outside, glabrous within, the lobes 4, oblong, 1.0–2.2 mm long, obtuse; stamens 4, exserted, the anthers oblong, ca. 1 mm long, the filaments threadlike, to 1.8 mm long, attached at the mouth; style filamentous, about as long as the tube, the stigmas 2, 0.3–1.0 mm long, slightly wider than the style. *Fruits* not seen.

Crusea longiflora extends from Mexico to Panama. Superficially the two Panamanian collections seem to belong to different species but floral dissections indicate that they are conspecific. On the dwarf plants of *Davidse & D'Arcy 10348*, the leaf blades show a reduction of lateral veins to 1–2 pairs.

CHIRIQUÍ: Large old lava flow, 3 km NE of El Hato del Volcán, base of Volcán de Chiriquí, 1–3 km E of highway, 1500–1800 m, *Davidse & D'Arcy 10348* (MO). Volcán Chiriquí above Boquete, roadside, *D'Arcy 9793* (MO).

28. DECLIEUXIA

Declieuxia H.B.K.,[38] Nov. Gen. Sp. Pl. folio 3: 275, *tab. 281.* 1819; quarto 3: 352, *tab. 281.* 1820. TYPE: *D. chiococcoides* H.B.K.

Herbs or subshrubs, sometimes ericoid in habit. *Leaves* occasionally verticillate, often coriaceous, frequently sessile; stipules interpetiolar, often subulate. *Inflorescences* terminal or axillary, cymose, usually branching dichotomously, or spikelike and racemiform; bracts often absent. *Flowers* with the calycine cup reduced, the lobes usually 4, equal or unequal; corolla variable in color, infundibuliform or cylindrical, the lobes 4, valvate; ovary 2-celled, the ovules 1 per cell, attached basally. *Fruits* a schizocarp, at first fleshy, didymous, indehiscent, compressed, the thin endocarp usually hard; seeds compressed.

Declieuxia ranges from Mexico, through Central America, the West Indies, and South America. There are about 40 species in the genus.

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[38] For synonymy see Kirkbride (1976).

Literature:

Kirkbride, J. H., Jr. 1976. A revision of the genus *Declieuxia* (Rubiaceae). Mem. New York Bot. Gard. 28(4): 1–87.

1. **Declieuxia fruticosa** (R. & S.) Willd. ex Kuntze, Rev. Gen. Pl. 1: 279. 1891.—FIG. 31.

Houstonia fruticosa Willd. ex Roem. & Schult.,[39] Syst. Veg. 3: 527. 1818. TYPE: Venezuela, *Humboldt & Bonpland 223* (B-Willd., holotype; P, isotype, neither seen).

Herbs, woody, to 3.5 m tall, the branchlets arising from the base or above, rarely restricted terminally, smooth, glabrous, delicately alate, the nodes well spaced. *Leaves* sessile, occasionally 3 per node, lanceolate, occasionally slightly falcate, to 5 cm long, to 1.2 cm wide, acute at the apex, obtuse to acute at the base, the costa prominulous above and beneath, the lateral veins ca. 5, arcuate, prominulous above and beneath, the intervenal areas reticulate, usually concolorous, lustrous above, marginate; stipules deciduous. *Inflorescences* terminal, cymose paniculate, a peduncle like axis (really a primary cyme) often present, to 2 cm long, or the stem tip with 3 primary cymes, each with an axis terminated by a sessile flower and 2 lateral branches, these branching into small cymules, the more profusely branched inflorescences often flat topped; bracteoles tending to persist, subulate. *Flowers* with the hypanthium subrotund, truncate, ca. 0.8 mm long, glabrous, the calycine teeth 4, erect, linear oblong, ca. 0.8 mm long, obtuse, glabrous; corolla white, the tube cylindrical, ca. 6 mm long, petaloid, densely villose below the middle within, the lobes oblong, to 2 mm long, glabrous, not cucullate; stamens 4, the anthers exserted, oblong, to 1 mm long, dorsifixed, the filaments to 1.5 mm long, attached in the middle of the tube or below; ovarian disc bilobed, pulvinate, the stigmas 2, slender, to 0.3 mm long, the style slender, to 2.5 mm long, attenuate basally, the ovary irregularly ribbed, 2-carpellate. *Fruits* sessile, rotund and ca. 2 mm in diam. or bilobed (2 carpels developing) and then wider than long, drying black, marcescent, often reticulate, glabrous, usually marginate; bracteoles persistent, subulate.

Declieuxia fruticosa ranges from Mexico south to Brazil.

CHIRIQUÍ: San Félix to Cerro Flor, 100–800 m, *Allen 1930* (MO). Savanna below Boquete, ca. 800 m, *D'Arcy 9773* (MO). 2 mi S of Boquete, 3–4000 ft, *D'Arcy & D'Arcy 6309* (MO). Boquete, 4000 ft, *Davidson 701* (MO); *Dwyer & Hayden 7593* (MO); *Partch 69-80, 69-128* (both MO). Boquete, Llanos Francia, *Stern et al. 1152, 1952* (both MO). Boquete, 1200–1500 m, *Woodson & Schery 791* (MO). COCLÉ: Natá, *Allen 827* (MO). Santa Clara Beach, *Croat 9588* (MO). Penonomé, *Ebinger* (MO). PANAMÁ: Taboga Island, *Allen 118, 1271* (both MO). Las Uvas, *Bartlett & Lasser 16650* (MO). Hacienda La Joya, *Dodge et al. 16897* (MO). Savanna near Río Pacora and Chepo Highway, *Duke 5898* (MO). Savannalike areas, road to Cerro Campana, *Duke 6029* (MO). Forest next to grasslands, Cerro Campana, 2400–2700 ft, *Duke 8701* (MO). Tocumen Airport, *Dwyer 1251, 4428* (both MO). Cerro Campana, *Dwyer et al. 4847* (MO, SCZ, UC); *Dwyer & Kirkbride 7824* (MO). Nuevo Arraijan, *Guerra 24* (MO). Cerro Campana, *Lewis et al. 3100* (COL, DUKE, K, MO, UC, VEN). Taboga Island, *Longfield 489* (MO). Cerro Campana, 2600 ft, *McDaniel 6824* (MO); *Nee 6872* (MO); *Witherspoon & Witherspoon 8365* (MO). Taboga Island, *Woodson et al. 1467* (MO). VERAGUAS: Yeguada,

[39] For synonymy see Kirkbride (1976) p. 17.

FIGURE 31. *Declieuxia fruticosa* (R. & S.) Kuntze.—A. Habit (×.6)—B. Flower, opened to show interior (×6.0). [After *Allen 1271*.]

Hladik 383 (MO). San José on Santiago-Santa Fé Road, 18 km S of Santa Fé, 400 m, *Nee 8180* (MO). Cañazas, *Tyson 3740* (MO).

29. DEPPEA

Deppea Schlecht. & Cham., Linnaea 5: 167. 1830. TYPE: *D. erythrorhiza* Cham. & Schlecht.

Choristes Benth., Pl. Hartw. 63. 1840. TYPE: *C. obtusifolia* Benth.

Shrubs. *Leaves* membranous, petiolate; stipules minute. *Inflorescences* terminal or axillary, the flowers rarely solitary, disposed in cymes or umbels, ebracteolate. *Flowers* pedicellate; calyx 4-lobed, the lobes persistent; corolla rotate, the tube often shorter than the lobes, glabrous within, the lobes 4, contorted; stamens 4, exserted, the filaments short, attached near the corolla mouth; style slender, the stigmas capitate or the 2 lobes evident, the ovary 2-celled, the ovules numerous, imbricate, the placentas peltately adnate to the septum. *Fruits* capsular, small, turbinate or obovoid, scarious to coriaceous, costate, loculicidally dehiscent from the apex; seeds numerous, subglobose, minute, obtusely angular, the testa hard, granulate.

Deppea ranges from Mexico to Venezuela. The genus includes about 20 species.

a. Flowers with hypanthium sparsely villose; fruits turbinate, 0.4–0.5 cm long, 8-costate; high mountain species, 1500–4500 m ..... 1. *D. grandifolia*
aa. Flowers with hypanthium glabrous; fruits rotund, to 0.2 cm long, 12-costate; low elevation species ..... 2. *D. panamensis*

1. **Deppea grandiflora** Schlecht., Linnaea 19: 748. 1847. SYNTYPES: México, *Leibold 235, 253, 263,* none seen.—FIG. 32.

D. costaricensis Polak., Linnaea 41: 566. 1877. TYPE: Costa Rica, *Polakowski 148* (not seen; photo, F).
D. floribunda Hemsl., Diag. Pl. Nov. 31. 1879. TYPE: *Botteri 937* (not seen; P, holotype; photo, MO).
D. longipes Standley, Contr. U.S. Natl. Herb. 18: 138. 1916. TYPE: Panama, *Pittier 3070* (US, holotype).

Trees 3–8 m tall, the branchlets terete, smooth, glabrous to puberulent. *Leaves* oblong, oblong rotund or oval, 6–17 cm long, 2.0–6.5 cm wide, deltoid at the apex, acuminate, the acumen to 1.5 cm long, acute, cuneate to acute at the base, the costa plane above, prominulous beneath, the lateral veins 8–12, arcuate, prominulous above and beneath, chartaceous, scarcely bicolorous, glabrous above except on veins, appressed villose on the veins beneath, the hairs often tufted in the vein axils; petioles to 4.5 cm long, to 0.2 cm wide, wiry, often arcuate and deflexed, densely pubescent; stipules deciduous, minute, broadly deltoid and glanduliferous (fide Standley). *Inflorescences* terminal or pseudo terminal, occasionally longer than the uppermost leaves, paniculate, the peduncles 3–4 cm long, villosulose, terminated by 3 primary branches, these to 2.5 cm long, strongly ascending, in turn branching, ultimately producing cymes. *Flowers* with the hypanthium oblong or turbinate, 1.6–2.0 mm long, ribbed, sparsely villose, the calyx cup scarcely measurable, the teeth reduced to 5 points, 0.2–0.6 mm

FIGURE 32. *Deppea grandiflora* Schlecht.—A. Fruiting branch (×½). [After *Tyson & Loftin 5964*.]—B. Inflorescence in bud (×½). [After *Wilbur 10291*.]

long, acute; corolla yellow, the tube compressed cylindrical, ca. 2 mm long, usually wider than long, petaloid, glabrous, the lobes 4, imbricate, oblong, 3.5–5.0 mm long, ca. 4 mm wide, longer than the corolla tube, venose, glabrous within except granulose puberulent in the middle; stamens ?4, the anthers oblong, 3.0–4.2 mm long, ca. 0.6 mm wide, basally bilobed, the filaments to 3 mm long, attached at the apex of the tube; ovarian disc platelike, the stigmas 2, clavate or rotund, ca. 1.3 mm long, the style slender, to 7 mm long, the ovary oblong, the wall thin, the ovules numerous on intrusive placentas. *Fruits* turbinate, 0.4–0.5 cm long, ca. 0.35 cm wide at apex, truncate, the calycine cup thickened and persistent as a rim, smooth, glabrous, 8-costate, the lateral split not extending below the terminal ringlike rim.

Deppea grandiflora ranges from Mexico to Panama.

CHIRIQUÍ: Boquete, Chiquero, *Davidson 541* (MO). Volcán de Chiriquí, *Davidson 1049* (MO). Camp Aguacatal, Chiriquí Volcano, 2100–2200 m, *Pittier 3070* (MO). Cerro Punta toward Bajo Grande *Wilbur et al. 10921* (MO).

2. **Deppea panamensis** Dwyer,[40] spec. nov. TYPE: Panamá, *Mori & Kallunki 4965* (MO, holotype).

Trees to 8 m, the branches numerous, the branchlets often drying yellow gray, the bark rough, cracking, glabrous, the nodes crowded at the apex of the twigs. *Leaves* lanceolate or obovate oblong, 8–15 cm long, 2.5–5.0 cm wide, obtuse, deltoid or subobtuse at the apex, acuminate, the acumen to 1 cm long, acute to attenuate acute at the base, the costa prominulous above and beneath, often drying dull red beneath, the lateral veins 9–11, prominulous, arcuate, the submarginal undulate vein well set in from the margin, the intervenal areas smooth, mosaiclike under magnification, the veinlets immersed, stiffly chartaceous, concolorous, glabrate above, minutely puberulent on the costa and the veins beneath, minutely white barbate in the leaf axils; petioles slender to 2.5 cm long; stipules apparently connate, cylindrical, 2.5–3.5 mm long, truncate or each part with a notch extending to the middle, coriaceous, minutely puberulent. *Inflorescences* terminal, pyramidal paniculate, puberulent, to 10 cm long, 8–10 cm wide, the peduncle suppressed, 3 branches arising from the twiglet tip, the middle one projecting upward as a rachis, or with the peduncle 2–4 cm long, slender, delicately winged, to 1.2 mm wide, bearing several well-spaced branches along its length, at least those below the middle of the rachis opposite, the uppermost often alternate, the inferior branches to 10 cm long, branching, the secondary branches producing several few-flowered cymules, or occasionally the flowers solitary. *Flowers* not seen except for the hypanthium, calyx and ovarian disc, these measuring ca. 1.5 mm long, glabrous; hypanthium turbinate, the calycine cup scarcely measurable, the teeth ca. 0.15 mm long. *Fruits* pedicellate, rotund, to 2 mm long, glabrous, shiny, loculicidally dehiscent almost to the base, the 4 resulting segments each with 3 delicate ribs, venose, the persistent ovarian disc in the unopened fruit moderately prominent, umbonate; seeds oblong or trapeziform, to 0.25 mm long, somewhat plano compressed, verrucose, honey colored.

Deppea panamensis is known only from Panama. It is distinguished by its minute fruit which separates to the base into 4 parts.

PANAMÁ: 5–10 km NE Altos de Pacora, *Mori & Kallunki 4965* (MO).

30. DIDYMAEA

Didymaea Hook. f., Benth. & Hook. f., Gen. Pl. 2(1): 150. 1873. TYPE: *D. mexicana* Hook. f.

Herbs, the stems weak, 4-angled. *Leaves* small, petiolate; stipules connate, subulate, persistent or deciduous. *Inflorescences* axillary, the pedicels often elon-

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[40] *Deppea panamensis* Dwyer, spec. nov. *Arbores* ad 8 m. *Folia* lanceolata vel obovato-oblonga, 8–15 cm longa, 2.5–5.0 cm lata, acumine ad 1 cm longo, venis lateralibus 9–11, chartacea, in venis et costa subtus puberula; petiolis ad 2.5 cm longis; stipulis fortasse connatis vagina cylindrica truncata vel retusa. *Inflorescentiae* terminales ad 10 cm longae, 8–10 cm latae. *Flores* hypanthio turbinato dentibus calycis ca. 0.15 mm longis. *Fructus* rotundi, ad 2 mm longi, glabri.

gating in fruit. *Flowers* with the hypanthium turbinate globose, the calycine cup truncate; corolla campanulate or rotate, the lobes 4, valvate; ovary 2-celled, the style thick; ovules 1 per cell, attached laterally to the septum. *Fruits* didymous, fleshy, globose, one lobe often abortive.

Didymaea is a genus of about 5 species. The genus has been poorly collected. The reader is referred to Standley & Williams (1975) where 2 new species are described and the genus is discussed in some detail.

Literature:

Standley, P. C. & L. O. Williams. 1975. *Didymaea* Hooker f. pro parte, Flora of Guatemala. Fieldiana: Botany 24: 60–63.

1. **Didymaea alsinoides** (Schlecht. & Cham.) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 1291. 1938.

Nertera alsinoides Schlecht. & Cham., Linnaea 6: 413. 1831. TYPE: not indicated.
Didymaea alsinoides var. *australis* Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 1292. 1938. TYPE: Costa Rica, *Brade & Brade 2143* (F, holotype).
Didymaea alsinoides var. *mollis* Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 1292. 1938. TYPE: Costa Rica, *Standley & Valerio 43949* (US, holotype).

Herbs, slender, fragile, the branches 4-angled, delicately porcate, the grooves densely hairy, the nodes well spaced. *Leaves* ovate or oblong ovate, 1.0–3.5 cm long, 0.5–1.5 cm wide, acute at the apex, rounded or obtuse at the base, occasionally truncate, usually inequilateral, with 1–2 pairs of veins arising from the base or with 1 pair of basal veins and 1 pair along the costa, membranous, concolorous, densely villose above and beneath; pedicels to 1 cm long, pubescent; stipules free, linear oblong, to 2.5 mm long, curled. *Pedicels* to 2 mm long. *Flowers* with the hypanthium ca. 0.5 mm long, glabrous, the raphides scattered, the calycine cup 0.2 mm long, the lobes 4, subtriangular, ca. 1 mm long with a small gland at the junction of 2 calycine lobes, the remaining floral parts not seen. *Fruits* didymous, oblong reniform, to 0.65 cm long, drying black, lustrous, pubescent; pedicels to 2 cm long.

Didymaea alsinoides is known only from Costa Rica and Panama.

In the material examined I found it possible to separate glabrous fruited material (*Cochrane et al. 6290*; *Croat 13674*) from non-glabrous (*Croat 13726*; *D'Arcy 9996*), thus seemingly supporting Standley's two varieties: var. *alsinoides* and var. *australis*. But *Davidson 395*, cited by Standley under var. *australis*, has some fruits sparsely hairy and others seemingly glabrous. In speaking of the undersurface of the blades of var. *australis* Standley says that they are "subtus glabra vel ad nervos hispidula." The leaves of *Davidson 395* are hispidulous beneath, the hairs not being restricted to the costa and veins. In other respects the leaves and fruits of all the material cited above are so similar that I see no reason for maintaining the two varieties.

CHIRIQUÍ: Cerro Horqueta, cloud forest, 1750–2100 m, *Cochrane et al. 6290* (MO). Las Cumbres near Cerro Punta, *Croat 13674, 13726* (both MO). Alto Respinga and above, ca. 2800 m, *D'Arcy 9996* (MO). Bajo Chorro, Boquete, 6000 ft, *Davidson 395* (MO).

31. DIDYMOCHLAMYS

Didymochlamys Hook. f., Icon. Pl. *pl. 1122.* 1872. TYPE: *D. whitei* Hook. f.

Epiphytic *herbs*. *Leaves* sessile or subsessile, alternate, anisophyllous, presumably distichous, the lateral veins evanescent; stipules small, dimorphic, subulate or linear lanceolate, apparently not occupying a fixed position with relation to the petiole attachment. *Inflorescences* terminal, pedunculate, the latter terminated by 2 large subrotund bracts enclosing 2 or more flowers. *Flowers* with the calycine lobes 5, subulate, erect; corolla funnelform, pubescent at the base within near the filament attachment point, the lobes themselves lobed basally; stamens 5, unequal, the anthers ovate or oblong, apiculate, the filaments attached near the base of the tube; ovary 2-celled, the placentas with numerous ovules, arising from the base of the septum. *Fruits* capsular, laterally compressed, 2-celled, dehiscing at the apex, the placentas attached basally to the septum· seeds numerous, minute, hairy, the hairs tufted at 1 point on the seed.

Didymochlamys is known from Panama, Colombia and Venezuela. There are two species in the genus.

Literature:

Hooker, J. D. 1872. *Didymochlamys whitei* Hook. f. in Hooker's Icones Plantarum 21–22, *pl. 1122.* London.

1. **Didymochlamys connellii** N. E. Brown, Trans. Linn. Soc. London, Bot. 6: 34. *pl. 5. fig. 1–9.* 1901. TYPE: British Guiana-Venezuela border, *McConnell & Quelch 714*, not seen.—FIG. 33.

Epiphytic *herbs*, the stems glabrous, minutely lenticellate, to 20 cm tall. *Leaves* sessile or subsessile, alternate, anisophyllous, the larger blades distichous, narrowly falcate oblong, occasionally vaguely narrow trapeziform, 4.5–10.0 cm long, 0.8–1.7 cm wide, the smaller blades narrowly subulate, to 10 mm long, occupying varying positions on the stem, the blades of the larger leaves with the costa plane beneath, to 1.5 mm wide, the lateral veins not visible (made visible by soaking), ca. 8, arcuate, forming a distinct, undulate, submarginal vein well in from the margin, with a slender vein paralleling the margin ca. 0.1 mm from the margin, chartaceous, concolorous, glabrous, smooth, minutely silver scaly under a lens, the margin vaguely revolute; stipules triangular, ca. 1 mm long, often deciduous. *Inflorescences* terminal, to 3.5 cm long, the peduncle 1.0–1.5 cm long, terminated by 2 large, subrotund bracts, to 1.5 cm wide, minutely acuminate, glabrous, membranous, replete with cystoliths, blue violet or sometimes green, enclosing 2 flowers, the bracteoles several, subulate, unequal, shorter than the calyx. *Flowers* at anthesis exceeding the bracts, sessile, the hypanthium to 2 mm long, to 1.8 mm wide, glabrous, the calycine cup absent, the lobes 5, subulate, subequal, ca. 1 mm long, glabrous; corolla bluish, the lobes white, to 1.8 cm long, the tube funnelform, to 5 mm wide above the middle, to 2 mm wide below the middle, glabrous outside, a few hairs within below the filament attachment, the lobes 5, the basal portion of each lobe ovate oblong, to 2 mm

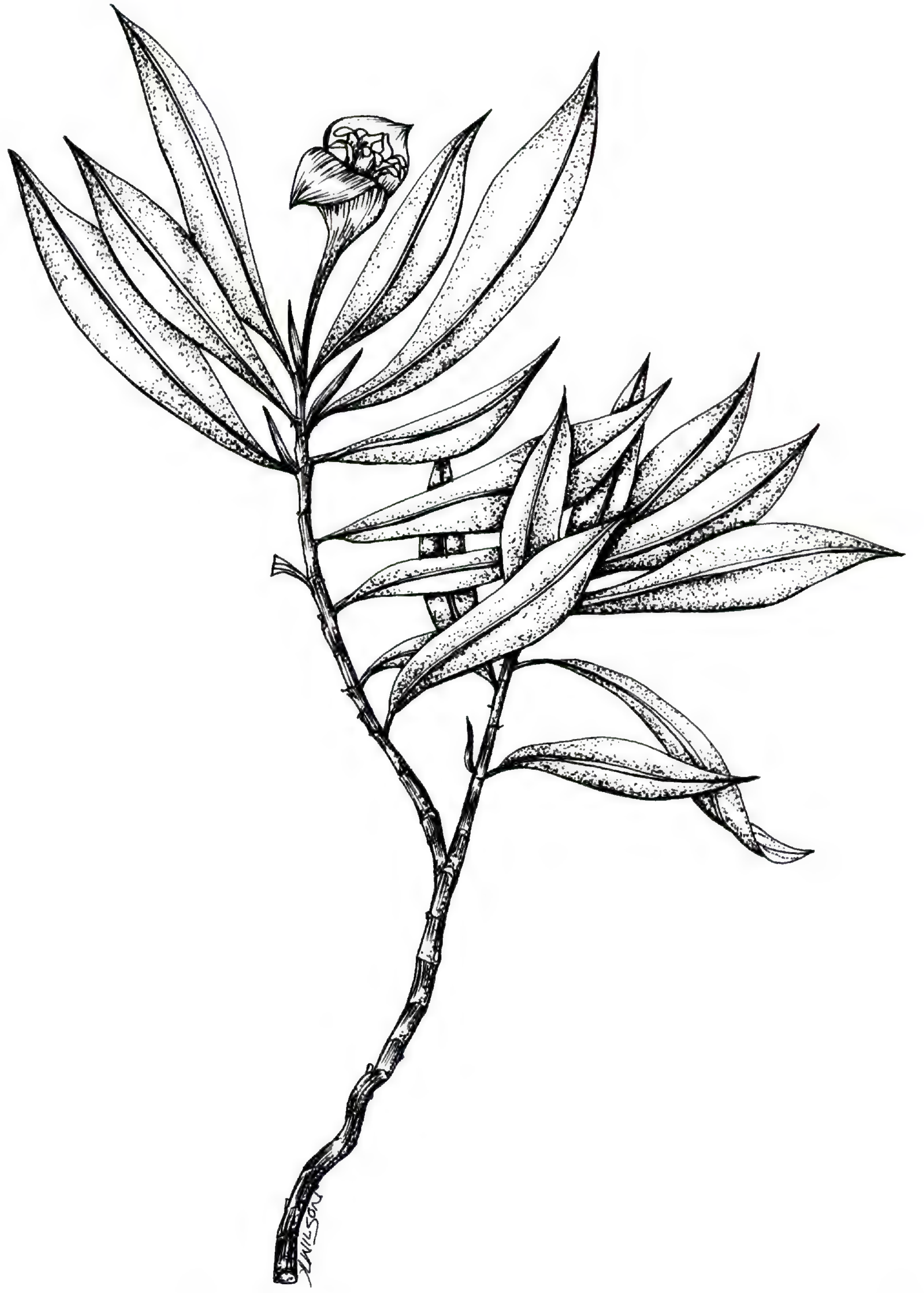

FIGURE 33. *Didymochlamys connellii* N. E. Brown. Habit (×¾). [After *Forero & Jaramillo 2647*, Colombia.]

long, with 2 lateral lobes, oblong, 2.5–3.0 mm long, infolded in the bud, curled and flaring at anthesis; stamens 5, 2 being slightly shorter, not exserted, the anthers oblong or ovate oblong, ca. 1.7 mm long, obtuse and minutely retuse, the filaments with the free portion longer than the anther; ovarian disc 2 or 4 lobed, the style slender, ca. 9 mm long, glabrous, the stigmas 2, ca. 1 mm long. *Fruits* not seen.

Didymochlamys connellii is known only from Guyana, Venezuela, and Panama. My description states that the leaves are anisophyllous, which appears to be the case. The larger blades are obviously distichous. The smaller subulate leaves have an intricate phyllotaxy. The more frequent situation is to have smaller leaves in a non-opposite position, but occasionally they are directly opposite the larger blade and like the latter have 2 stipules at the base, the minute stipules being the counterparts of the stipules subtending the larger blades. Whether this alternate arrangement fits the Fibonnaci series pattern has to be determined.

In Brown's original description of *D. connellii,* he states: "Leaves alternate . . . stipule solitary, 3–4 lin. long, linear." Hooker described the only other known species of *Didymochlamys, D. whitei* Hook. f., from Colombia. This species is based on a collection from "the dense woods at Quibdo, on the river Atrato, an affluent of the Magdalena, growing on stumps of trees, *R. B. White Esq.*" Hooker stated (my translation) that the stipules are well set apart and stipules like the leaves are seemingly remote; some membranous, located on the dorsal surface of the prostrate stem, linear lanceolate, entire or 2-fid (or 2-nate), the petiole remote or close [to the stipule]; the others coriaceous or horny when dry, minute, clawed, almost axillary. Hooker's plate #1122 is certainly that of *Didymochlamys*; figure 1 in the plate shows the base of what I designate as a "large blade" and directly opposite 2 subulate structures which I designate as "small blades." It is not clear whether the artist has shown the triangular and minute stipules which I assume are present in *D. whitei* and which Hooker described in his diagnosis.

Steyermark (1974) says: "Estipulas solitarias o en pares con dos formas; una axilar en la base del peciolo, diminuta y en forma de garra, la otra solitaria o en pares, alargada, linear o linear-lanceolada, entera o bifida." While this considers what I call a small blade to be a stipule, it is much clearer than Hooker's description. The sketch in Steyermark's work is in general very good except that the subulate stipules are shown opposite the large leaves with the small leaves lacking stipules, a feature subject to question.

A critical point in determining terminology is that the small leaves may themselves be subtended by minute stipules; therefore, I regard the awl shaped structures as leaves and not as stipules. In fairness to the argument, the small leaf lacks venation.

In the Dressler collection I found no evidence of the small leaf or so-called stipule being bifid. In soaking the stem of Dressler's collection in a 2% technical detergent (Aerosol OT) solution, I found that the small leaf or stipule turned white in contrast to all the other vegetative parts. This is of uncertain significance.

COCLÉ: Aserradero El Copé, 8 km N of El Copé, ca. 900 m, *Dressler 5640* (MO).

32. DIODIA

Diodia L., Sp. Pl. 1: 104. 1753; Gen. Pl., ed. 5. 45. 1754. TYPE: *D. virginiana* L.

Annual or perennial *herbs*, the stems terete or 4-angled. *Leaves* opposite or seemingly verticillate, sessile or short petiolate; stipules connate, united with the petioles, the sheath filiform setose, the processes often ciliate. *Inflorescences* axillary or in terminal spikes, the capitate heads borne in the axils of reduced leaves. *Flowers* sessile, usually 4-merous, the calycine tube 2–6-lobed, often with small interdental glands; corolla infundibuliform to hippocrateriform, the lobes 4–6; stamens 4–6, the anthers exserted, dorsifixed, the filaments attached at the mouth; ovary mostly 2-celled, the ovules solitary, adnate to the septum in the middle. *Fruits* partly superior, the 2 cocci indehiscent, the endocarp thick and woody, smooth or costate, the ventral face plane, the endosperm relatively remote from the hilar ridge.

Diodia occurs in Mexico, Central America, the Antilles, and South America. Some species are found in the United States and in Africa. The genus has about 50 species.

Literature:

Steyermark, J. 1972. The Botany of the Guayana Highland—Part IX. Mem. N.Y. Bot. Garden 23: 788–805.

a. Leaves 1.2–3.0 cm wide.
b. Inflorescences flagelliform in appearance and with obviously reduced leaves or bracts; leaves with lateral veins not deeply immersed above ..... 1. *D. denudata*
bb. Inflorescences not flagelliform, not with obviously reduced leaves or bracts; leaves with lateral veins obviously immersed beneath ..... 2. *D. sarmentosa*
aa. Leaves 0.2–0.4(–0.8) cm wide ..... 3. *D. teres*

1. **Diodia denudata** Standley, J. Wash. Acad. Sci. 15: 105. 1925. TYPE: Panamá, *Standley 28123* (US, holotype).—FIG. 34.

Vines, subshrubs or shrubs, the stems spreading, the nodes usually well spaced, the short axillary branchlets often simulating crowded leaves, glabrous, delicately alate on the angles. *Leaves* lanceolate or obovate-lanceolate, 4.0–7.5 cm long, 2–3 cm wide, acute at the apex, acute to attenuate acute at the base, often inequilateral, the costa immersed or plane above, prominulous to subplane beneath, the lateral veins ca. 7, strongly arcuate, ascending with 1 intermediate vein occasionally found between 2 laterals, papyraceous, scarcely discolorous, smooth when dry, minutely puberulent or scabridulous on costa and veins beneath, glabrate above; petioles slender, to 1.5 cm long or sometimes the blades lightly decurrent; stipules triangular or compressed rotund, the sheath shorter than the setas, the latter unequal puberulent. *Inflorescences* axillary, capitate, to 0.4 cm wide, the heads arranged along the length of a whiplike branch, the latter to 45 cm long, the internodes elongate, the subtending leaves ?bracts lanceolate, 0.5–2.0 cm long. *Flowers* minute; hypanthium ca. 0.3 mm long, the calycine cup minute, glabrous, the lobes 4, sometimes 1 or 2 of these about ½ the length of the longer lobes, ovate subulate, to 0.4 mm long, scabridulous ciliate; corolla

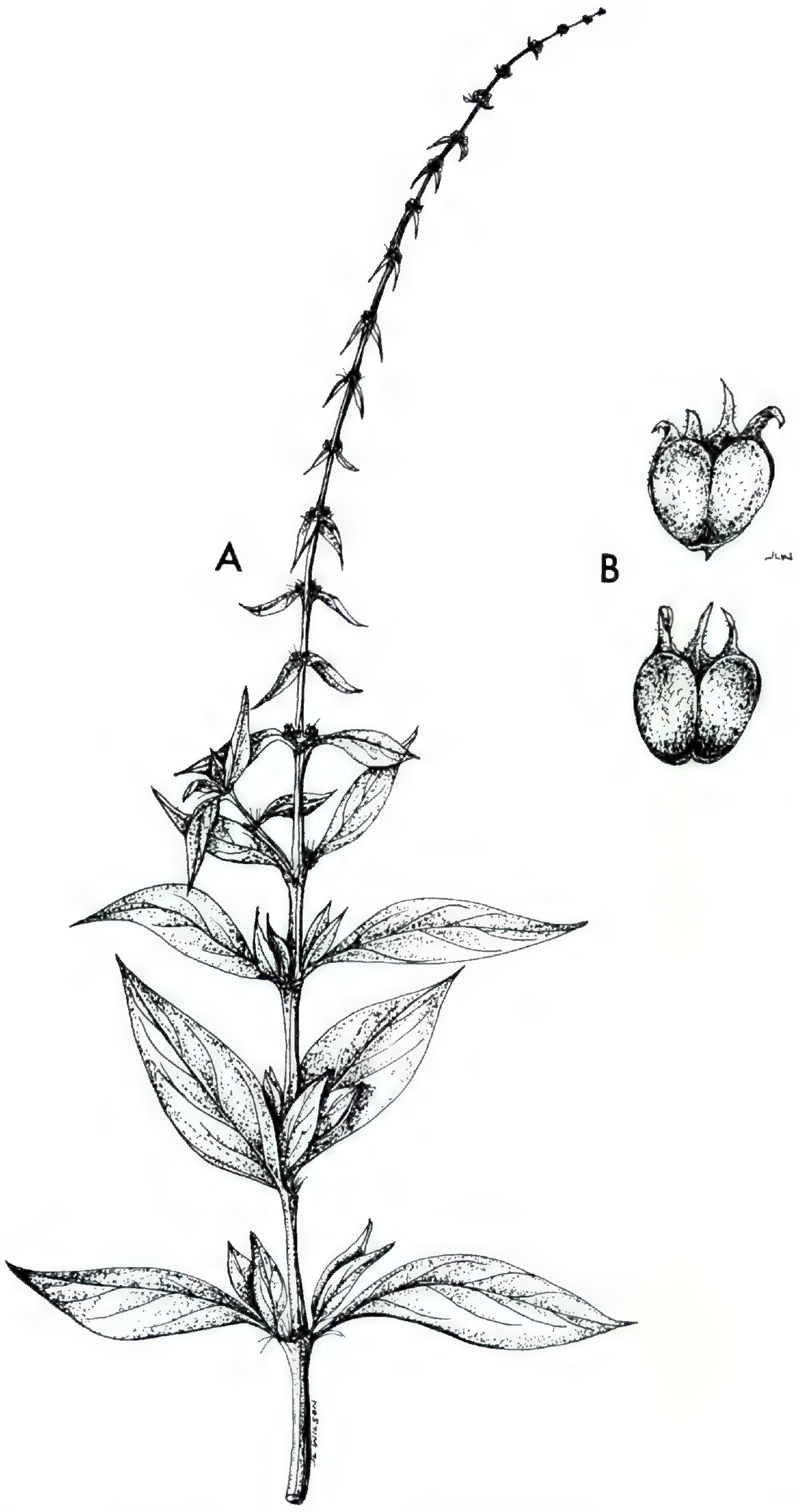

FIGURE 34. *Diodia denudata* Standley.—A. Habit (×½).—B. Fruit in ventral and dorsal views (×12½). [After *Croat 13191*.]

white, the tube ca. 0.5 mm long, the lobes 4, about equaling the tube; stamens 4, attached at the mouth; style ca. 0.5 mm long, the stigmas to 0.3 mm long. *Fruits* sessile, subrotund, to 1.3 mm long, often slightly wider than long, with a distinct median furrow, scabridulous, delicately red farinose or delicately reticulate, otherwise smooth, each valve indehiscent, the calyx persistent; seed oblong, to 0.8 cm long.

Diodia denudata is known only from Panama and Colombia.

BARRO COLORADO ISLAND: *Aviles 94* (MO); *Croat 4373, 8738* (both MO). CANAL ZONE: Río Mendosa, ½ km downstream from Pipeline Road, *Nee 9577* (MO). Fort Lorenzo, *Piper 5895* (US). Río Tapia, *Standley 28123* (MO, US). COLÓN: Santa Rita Ridge, *Croat 13191* (MO); *Lewis et al. 5238* (MO). DARIÉN: Santa Fé, *Duke 9488* (MO). PANAMÁ: Río Tocumen, *Standley 29364* (US). COLOMBIA: CHOCO: Punta Las Barcas and Turbo, *Duke 9695* (MO). Madurex Logging Camp, *Duke 9977* (MO).

2. **Diodia sarmentosa** Swartz, Prodr. Veg. Ind. Occ. 30. 1788. TYPE: Jamaica, *Swartz*, not seen.

Herbs or shrubs, often elongate, branching freely, obtusely angular, puberulent, the nodes well spaced. *Leaves* sessile or subsessile, elliptic oblong or ovate oblong, 3–5 cm long, 1.2–1.8 cm wide, acute to deltoid at the apex, often vaguely acuminate, cuneate at the base, the costa immersed above, prominulous beneath, the lateral veins 4–5, strongly arcuate ascending, immersed above, subplane to prominent beneath, the intervenal areas generally smooth beneath, the veinlets evanescent, the margin revolute, stiffly chartaceous, concolorous but appearing bullate above and rough to the touch, scabridulous above and beneath, the hairs above short, white, calcareous punctate, strigose, the hairs beneath more slender and somewhat longer; stipules with sheath turgid, stiff, to 3 mm long, the setas subulate, slender, to 7 mm long, pubescent. *Inflorescences* in the axils along the length of the branches, the flowers congested, forming a spikelike mass ca. 0.5 cm in diam. *Flowers* not seen. *Fruits* oblong or turbinate, 5 mm long, truncate, smooth, glabrate to puberulent, often lightly punctate and bearing a few faint longitudinal lines, the calyx persistent or not, the teeth ovate triangular, ½ the length of the valves, the inner face of valve like a drum head, white, stiffly membranous, with a delicate median vein.

Diodia sarmentosa is a common weed in the West Indies, throughout Middle America, and northern South America. It also occurs in the Pacific islands, the Malaya Peninsula and tropical Africa. Steyermark (1972) in his key to *Diodia* stresses several diagnostic floral characters: "corolla 2–5 mm long . . . style subcapitate, shortly bilobate . . . calyx lobes linear-lanceolate, 1.0–2.2 mm long."

CANAL ZONE: Coco Solo, *Dwyer & Duke 7919* (COL, MO, UC). BARRO COLORADO ISLAND: *Croat 5129, 5276, 5525* (all MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al. 2781* (MO).

3. **Diodia teres** Walt., Fl. Carol. 87. 1788. TYPE: "In sabulosis sylvarum a Virginia ad Carolinam" *Walter* (BM, not seen).

D. prostrata Swartz, Prodr. Veg. Ind. Occ. 30. 1788. TYPE: not seen.

Herbs, often woody at the base, prostrate and forming mats, or erect and to 0.3 m tall, the branches terete or angular, delicately 4-ribbed, white villose, the

hairs to 1.2 mm long, with smaller crinkly hairs interspersed. *Leaves* sessile, spreading, occasionally deflexed, subulate, narrowly oblong or narrowly ovate oblong, 1.5–2.5 cm long, 0.2–0.4(–0.8) cm wide, subequilateral, tapering acutely at the apex, the terminal seta to 1.5 mm long, white, basally obtuse or truncate, the costa subimmersed above, prominulous beneath, the lateral veins evanescent, stiffly papyraceous, white punctate and hispid above and beneath, the hairs to 2 mm long, erect or curled, the margin frequently revolute, scabridulous, the hairs usually associated with marginal setas; stipules connate, cuplike, the setas prominent, stiff, ascending, linear, ca. 10, subequal, to 6(–7) mm long, usually 2–3 times the length of the sheath, the latter with few, elongate, stiff, reflexed, white hairs, these usually associated with the marginal setas, the hairs at the base of the sheath absent, or if present, shorter and weaker. *Inflorescences* axillary, the flowers few. *Flowers* with the hypanthium oblong, to 1.8 mm long, truncate, densely hirsute, the calycine cup scarcely measurable, the teeth 4, unequal, subulate, to 2 mm long, acute, petaloid, densely ciliate with 1–2 glandular, subulate structures, ca. 0.1 mm long in the sutures; corolla white or pink, the tube campanulate, to 5 mm long, petaloid, glabrous within except for a ring of hairs ca. 1.5 mm from the base of the tube, with scattered uncinate hairs outside, the lobes 4, oblong or deltoid, to 2 mm long, acute; stamens 4, the anthers oblong, to 1.2 mm long, obtuse, dorsifixed or subversatile, the filaments short, attached just below the middle of the throat; stigmas 2, the style filamentous, to 7 mm long, the ovary thick walled. *Fruits* sessile, indehiscent, of 2 mericarps, turbinate, ca. 3 mm long at maturity, hispid; seeds red brown, reticulate, the calyx deciduous.

Diodia teres is common throughout Middle America and South America. It is found in the United States, ranging from Connecticut south to Florida and Texas and westward to Oklahoma.

CHIRIQUÍ: Cerro Horqueta, ca. 5000 ft, *Dwyer et al. 458* (GH, MO, US). COCLÉ: Natá, *Allen 835* (MO). E of Natá, *Duke 12384* (MO). Penonomé, *Ebinger 1006* (MO). HERRERA: Las Minas and Pesé, *Burch et al. 1323* (F, GH, K, MO, NY, UC, US); *Duke 12301* (MO). Las Minas, La Peña, *Stern et al. 1778* (MO). Ocú, *Tyson et al. 2857* (MO). ½ mi N of Macaras, Río La Villa, *Tyson et al. 3131* (MO, SCZ). VERAGUAS: 5 mi NE of La Mesa, *Blum & Tyson 657* (MO). 10 mi W of Santiago, *Duke 13658* (MO). Isla de Coiba, *Dwyer 1675* (MO). 2 mi W of Santiago, *Dwyer et al. 7535* (GH, MO, US). 50 km E of Santiago, *Folsom 3911* (MO). 1–2 mi above Santa Fé, *Gentry 3047* (MO). ½ km W of Highway 50, turnoff to Ocú, *Nee 8001, 8009* (both MO). Just S of Santa Fé, 450 m, *Nee 8026* (MO).

33. DRESSLERIOPSIS

Dressleriopsis Dwyer, gen. nov.[41] TYPE: *D. panamensis* Dwyer.

Subshrubs. *Leaves* often cordate toward the base, petiolate; stipules free, triangular. *Inflorescences* axillary, the flowers disposed in globose heads, the peduncle absent, the bracteoles subulate. *Flowers* subsessile, the calycine cup

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[41] *Dressleriopsis* Dwyer, gen. nov. *Suffrutices*. *Folia* saepe versus basin cordata petiolata; stipulis liberis triangularibus. *Inflorescentiae* axillares floribus in caespites globosas dispositis, pedunculo nullo; bracteolis subulatis. *Flores* subsessiles cupula calycina intus glandulis ornata lobis 4; corolla tubo cylindrico intus glabro lobis 5; staminibus 5 antheris oblongis filamentis brevibus; disco ovarii pulviniformi; stylo gracile; stigmatibus 8; ovario 8-locellato ovulis 8 uno utrumque loculum complente placentatione axili. *Fructus* bacati pyrenis 8 lobis calycis persistentibus.

with 4 lobes, with glands inside; corolla tube cylindrical, the lobes 5; stamens 5, the anthers oblong, the filaments short; style slender, the stigmas 8; ovary 8-locellate, the ovules 8, each filling a locule, the placentation axile; ovarian disc cushion shaped. *Fruits* baccate; pyrenes 8; the lobes of the calyx persistent.

The 8-carpellate nature of the flowers distinguishes the genus from all other New World genera of the Rubiaceae. It is named for Robert L. Dressler.

1. **Dressleriopsis panamensis** Dwyer.[42] TYPE: Panamá, *Dressler 3560* (MO, holotype).—FIG. 35.

Subshrubs to 1 m tall, often with a pair of slender, rigid, opposite branches. *Leaves* oblong, to 19 cm long, to 9 cm wide, deltoid to subobtuse, short acuminate, basally cordate, truncate, or auriculate, the lateral veins ca. 15, arcuate, forming a conspicuous submarginal vein, the intervenal areas, spreading reticulate, rigidly chartaceous, discolorous, pilose petioles to 6 cm long; stipules triangular, free, ca. 7 mm long, ca. 6 mm wide, carnose, glabrous inside, diffusely hirsute outside. *Inflorescences* axillary, the flowers congested into sessile globose heads 2 cm in diam.; bracteoles subulate, to 2 mm long. *Flowers* subsessile; hypanthium subrotund, to 2 mm long hirsute, the hairs septate, lobes 4, to 4 mm long, ca. 1.6 mm wide, basally attenuate glandular inside at the base; corolla white, cylindrical, ca. 3.5 mm long, glabrous within, the lobes 5, often horizontally expanded, oblong, ca. 4 mm long, villose, attenuate; upwards anthers 5, slightly exserted, subsessile, oblong, ca. 1 mm long, glabrous; disc cushion shaped, ca. 0.5 mm wide, the locules 8, a single linear oblong axile ovule filling each locule, the style narrowly, to 5 mm long, the stigmas 8, oblong, radiate. *Fruits* (?immature) berrylike, globose, to 1.1 cm in diam., not ribbed, compressed at the apex, the internal pulp with abundant raphides, the pyrenes pyrenes 8, pear shaped or somewhat hemispherical, ca. 3 mm long, hard, orange, with an oblong scar on the concave side.

Dressleriopsis panamensis is known only from Panama.

COLÓN: Between Cerro Jefe and La Eneida, 900 m, *Correa & Dressler 1121* (MO). Santa Rita Ridge, ca. 800 ft, *Dwyer et al. 9035* (MO). PANAMÁ: Llano-Cartí Road, 7–12 km from Panamerican Highway, *Croat 25164* (MO). La Eneida, *Dressler 3560* (MO). 16 km above Panamerican Highway, road from El Llano to Cartí-Tupile, *Kennedy et al. 2433* (MO). El Llano-Cartí Road, 10 km from Panamerican Highway, *Mori & Kallunki 2340* (MO). El Llano-Cartí Road, *Mori & Kallunki 2852, 2856* (both MO). El Llano-Cartí Road, 8 km N of Panamerican Highway at El Llano, *Nee & Warmbrodt 10343* (MO).

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[42] *Dressleriopsis panamensis* Dwyer, spec. nov. *Suffrutices* ad 1 m alti. *Folia* oblonga acuminata versus basin saepe cordata, venis lateralibus ca. 15, arcuatis, rigido-chartacea discoloria pilosa praecipue in costa venisque; stipulis triangularibus, ca. 7 mm longis, ad 7 mm latis, extus diffuso-hirsutis; petiolis ad 6 cm longis, dense pilosis. *Inflorescentiae* sessiles, globosae in axillis inferioribus superioribusque dispositae: bracteolis subulatis, ad 2 mm longis. *Flores* subsessiles hypanthio hirsuto lobis calycis 4, ad 4 mm longis; corolla tubo cylindrico, ca. 3.5 mm longo, intus glabro lobis 5 saepe applanatis, ad 4 mm longis, utrinque villosis; antheris subsessilibus, ca. 1 mm longis; loculis ovarii 8 placentatione axile, ovulis 8; stylo lineari, ad 5 mm longo; stigmatibus 8, oblongis, radiate dispositis. *Fructus* globosi, ad 1.8 cm in diam., dense hirsutis pyrenis 8 pyriformibus, ca. 3 mm longis.

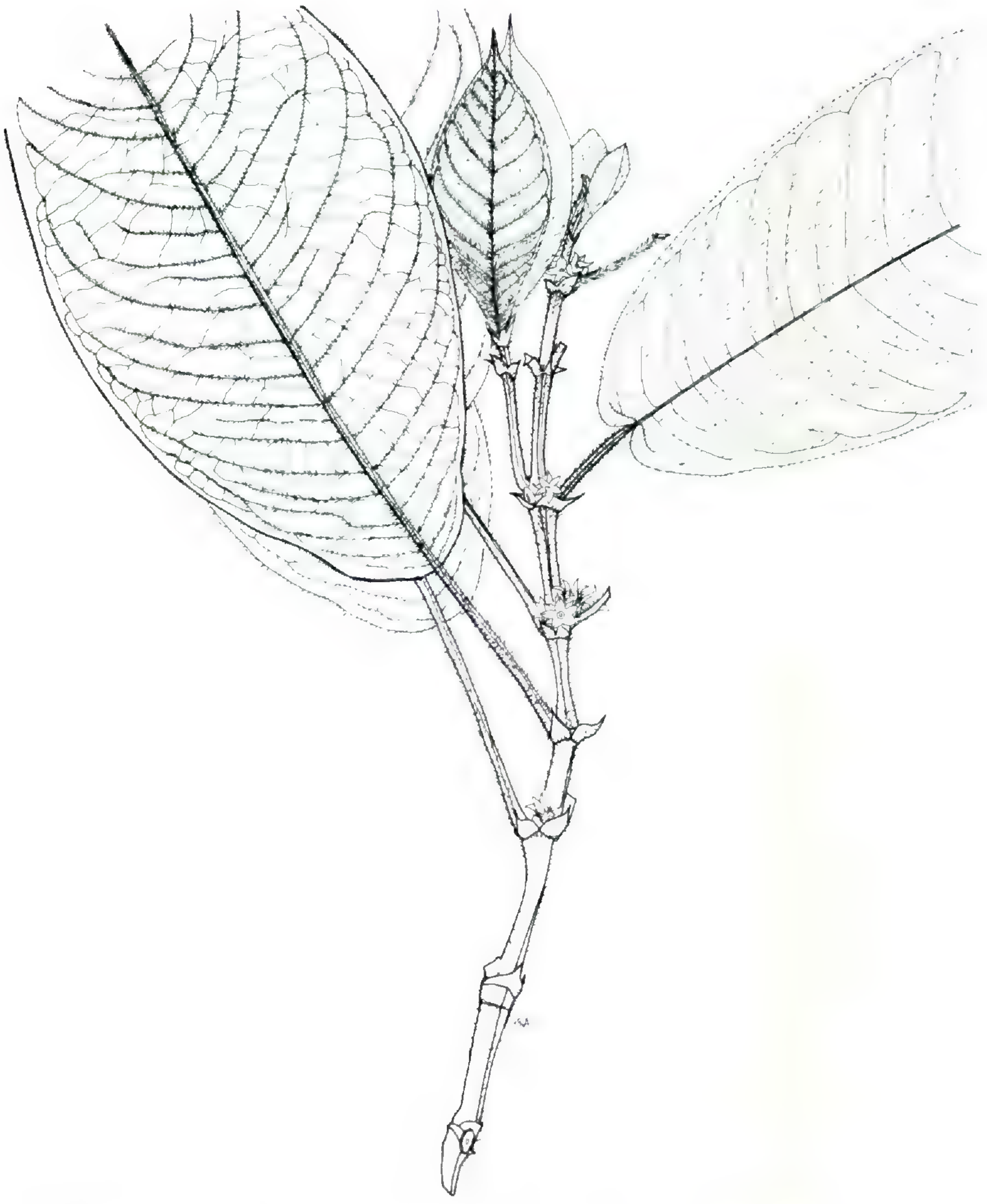

FIGURE 35. *Dressleriopsis panamensis* Dwyer. Habit (×.45). [After *Mori & Kallunki 2852.*]

34. DUROIA

Duroia L.f., Suppl. Pl. 209. 1781. Nomen cons. TYPE: *D. eriopila* L.f.

Dioecious *trees* or *shrubs*. *Leaves* usually coriaceous; stipules caducous, oblong, connate, calyptrate. *Corolla* lobes contorted in bud; ovary 1–4 celled, many ovulate, *Fruit* baccate, 1–4 celled; seeds compressed, horizontal.

Duroia includes about 20 species occurring in much of tropical America.

1. **Duroia hirsuta** (P. & E.) Schum. in Mart., Fl. Bras. 6: 367. 1889.

Tree or *shrub*; branches hirsute. *Leaves* oblong obovate, villous, 10–28 cm long. *Inflorescences* golden hirsute. *Calyx* truncate, the lobes linear, 5–12 mm long; corolla white, the tube 2–3 cm long, pubescent, the lobes oblong. *Fruits* golden hirsute, 2–6 cm long.

Not yet collected in Panama, *Duroia hirsuta* ranges from Guatemala to Costa Rica and is expected in Panama.

35. ELAEAGNIA

Elaeagnia Wedd., Monogr. Cinch. 94. 1849. TYPE: *E. utilis* (Goud.) Wedd.

Trees or shrubs. *Leaves* coriaceous, petiolate; stipules free or connate. *Inflorescences* large, terminal, paniculate or rarely racemose. *Flowers* small, the calycine cup 5-lobed, inflated, persistent; corolla reduced, infundibuliform, cylindrical or somewhat bell shaped, the throat villous, the lobes 5, recurved, contorted in bud; stamens 5, the anthers oblong, dorsifixed, the filaments exserted, geniculate at the base; ovarian disc orbicular, the style short, the stigmas 2, obtuse, the ovules numerous, the placentas peltately affixed to the septum. *Fruits* capsular, small, loculicidally dehiscent into 2 valves, these split apically; seeds minute, the testa membranous.

Elaeagnia, a genus of about 15 species, ranges from Central America to South America. It also occurs in Cuba.

Literature:

Steyermark, J. S. 1965. Botany of the Guayana Highland—Part VI. Mem. N.Y. Bot. Garden 12: 186–192.

a. Leaves short pilose beneath; petioles less than 1 cm long; fruits ca. 4.5 mm long ..... 1. *E. auriculata*

aa. Leaves glabrous beneath; petioles 2.0–2.5 cm long; fruits ca. 7 mm long ... 2. *E. nitidifolia*

1. **Elaeagnia auriculata** Hemsl., Diag. Pl. Nov. 32. 1879. TYPE: Costa Rica, not seen.—FIG. 36.

Shrubs or *trees*, the branchlets 4-angled, glabrous to pubescent, often rimose. *Leaves* elliptic, ovate elliptic to obovate elliptic, often rounded, to 40 cm long, to 25 cm wide, rounded to acute at the apex, often abruptly acuminate, rounded or subauriculate at the base, the costa slender, prominulous, the lateral veins ca. 15, angular ascending, subcoriaceous, glabrous to densely short pilose above, more so beneath; petioles absent or to 1 cm long; stipules deciduous, oblong, 4.5–5.0 cm long, ca. 2 cm wide, rounded at the apex, truncate at the base. *Inflorescences* often exceeding the leaves, often epedunculate or seemingly with 3 peduncles arising from the apex of the twiglets, puberulent, the rachis twisted, plane, the branches opposite, well spaced, the flowers solitary or in few-flowered cymules. *Flowers* on slender pedicels, 2–5 mm long; hypanthium compressed oblong, ca. 1 mm long, pilose, the calycine cup ca. 0.8 mm long, scarious, eglandular within, the calycine lobes 5, expanded, compressed rotund, ca. 1 mm long; corolla white, the tube short, ca. 1 mm long, petaloid, venose, glabrous outside, densely short bearded at the point of filament attachment, the hairs forming a ball-like bulge, the lobes 5, oblong, ca. 1 mm long, rounded; stamens 5, exserted, the anthers oblong, ca. 2 mm long, the filaments to 2.5 mm long, glabrous distally; style to 2.5 mm long, the stigmas 2, fleshy but subplane, to 2 mm long, to 1 mm wide. *Fruits* oblong or oblong rotund, ca. 4.5 mm long, puberulent or glabrous, dark red.

Elaeagnia auriculata is known from Honduras, Costa Rica, and Panama. The single collection from Panama is in fruit with only one leaf present and the inflo-

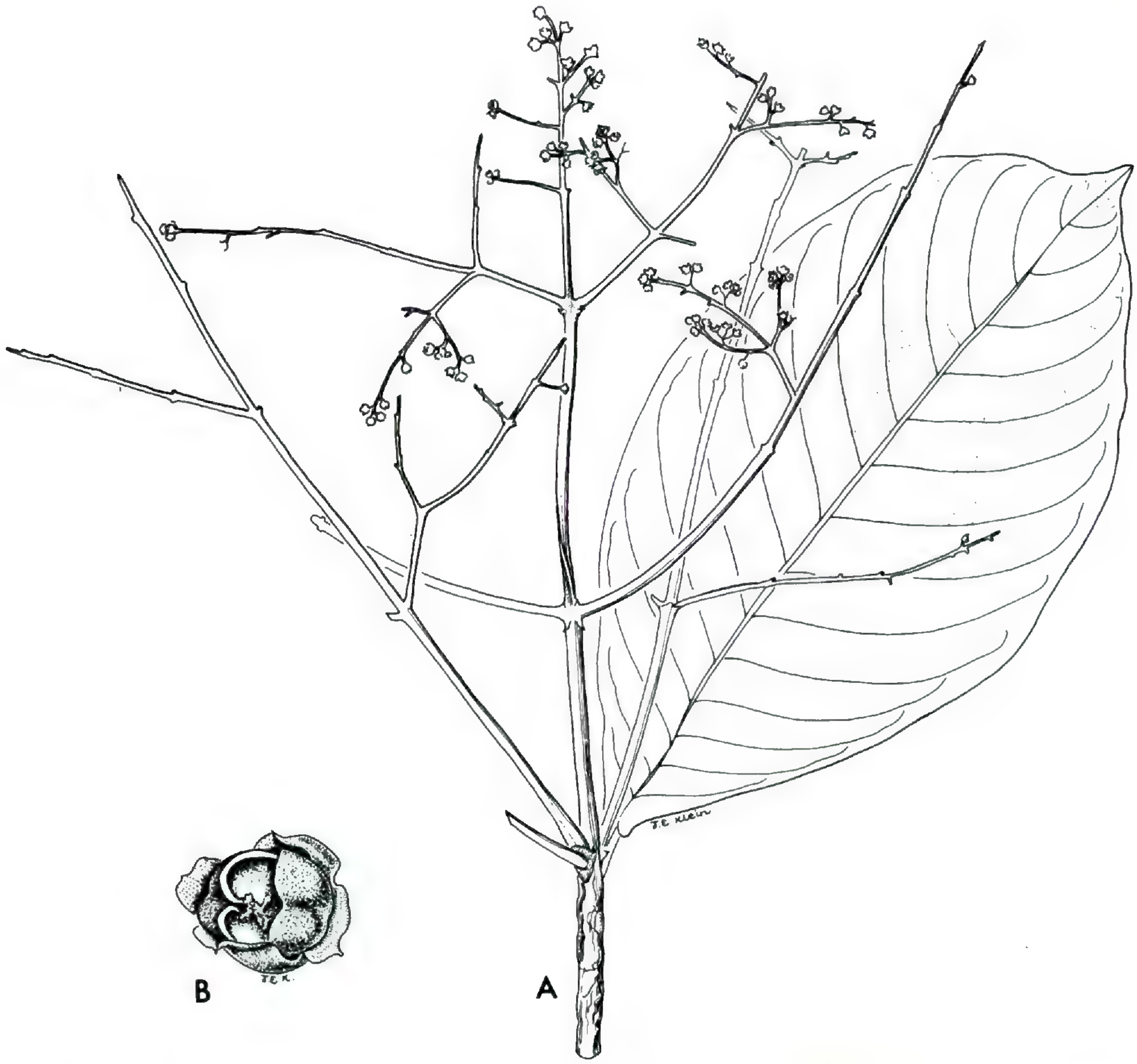

FIGURE 36. *Elaeagnia auriculata* Hemsl.—A. Habit (×½).—B. Flower (×5). [After *Duke 6580.*]

rescence in poor condition. The flower is described above from *Molina 6102* (F) from Costa Rica.

DARIÉN: Cerro Pirre, W slope, *Duke 6580* (MO).

2. **Elaeagnia nitidifolia** Dwyer.[43] TYPE: Panama, *Correa et al. 1608* (MO, holotype).

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[43] *Elaeagnia nitidifolia* Dwyer, spec. nov. *Arbores* ramulis glabris in sicco nitido-glabris. *Folia* oblonga, 7–23 cm longa, 4.0–8.5 cm lata, apice obtusa vel lato-cuneata acuminata basi acuta venis lateralibus 12–14 tenui-coriacea glabra minuto-farinoso-punctata; petiolis 2.0–2.5 cm longis, glabris; stipulis deciduis fortasse connatis cylindricis, ad 0.5 cm longis, truncatis coriaceis glabris. *Inflorescentiae* terminales cymoso-paniculatae, 12–16 cm longae, ad 10 cm latae, glabrae, in sicco rubrae; pedunculo ad 8.5 cm longo ramis paucis oppositis vel subopppositis bene distantibus; floribus in cymis saepe unilateraliter dispositis. *Flores* pedicellati cupula calycis crateriforme, ca. 2 mm longa, edentata coriacea glabra; corolla alba tubo ad 1.5 mm longo, extus glabro intus barbato lobis 2-plo longioribus; antheris oblongis, ca. 1.5 mm longis, exsertis, filamentis ca. 2.5 mm longis. *Fructus* turbinati, ad 7 mm longi, loculicide dehiscentes glabri cupula calycis ad 2 mm longa persistenti seminibus multis ca. 0.1 mm longis, reticulatis.

Trees, to 6 m, the branchlets often drying green, glabrous, subterete, the petiole scars conspicuous, crowded, the terminal bud black, shiny, covered with a resinous exudate. *Leaves* ascending, oblong, 7–23 cm long, 4.0–8.5 cm wide, obtuse to widely cuneate above, acuminate, the acumen triangular, to 0.5 cm long, acute at the base, often ultimately slightly contracted, the costa prominulous above, prominent beneath, drying dull, shiny red, the lateral veins arcuate, 10–14, prominulous above and below, the submarginal undulate vein obvious or not, the reticulate intervenal areas small but conspicuous, the smaller veins pinnatiform, thin coriaceous or coriaceous, usually slightly discolorous, drying tan beneath, glabrous, minutely farinose punctate under magnification above and below, the margin thinly callose marginate; petioles 2.0–2.5 cm long, rigid, stout, shiny, rubescent; stipules persistent only at twiglet tips, connate, located immediately above the point of petiole attachment, perhaps eventually splitting, cylindrical, somewhat oblong in outline, to 0.5 cm long, truncate, coriaceous, glabrous, covered with a glistening resin. *Inflorescences* terminal, cymose paniculate, somewhat oblong in outline, 12–16 cm long, to 10 cm wide, glabrous, with 3 peduncles terminating the twiglet, or perhaps the peduncle suppressed and 3 branches arising directly from the twiglet tip, the median peduncle or branch 7.0–8.5 cm long, rigid, ascending, plano compressed, somewhat twisted, drying shiny deep red, the lowermost branches 2.5–3.0 cm long, 7–9 cm between the first and second pair of branches, the smaller branches from these 2.5–3.0 cm long, opposite or subopposite, well spaced, the flowers usually 12–15 per branchlet, the cymes 3–4-flowered, usually unilaterally disposed, the flowers occasionally solitary. *Flowers* pedicellate, the pedicels reflexed, to 5 mm long, glabrous, stiff; hypanthium scarcely measurable, acute at the base, glabrous, the calyx cup bowl shaped, ca. 2 mm long, truncate, edentate, coriaceous, glabrous; corolla white, the tube cylindrical, ca. 1.5 mm long, glabrous outside, densely barbate within, the hairs thin, white, the lobes 5, oblong, ca. 2 times the length of the tube, obtuse, glabrous except densely barbate at the base within; stamens 5, exserted, the anthers oblong, ca. 1.5 mm long, sub-basifixed, the filaments ca. 2.5 mm long, glabrous, affixed near the mouth; ovarian disc pancakelike, marcescent on drying; style ca. 4 mm long, glabrous, the stigmas 2, ca. 1.5 mm long, scarcely wider than the style. *Fruits* turbinate, to 6 mm long, truncate, glabrous, drying brown, withered reticulate on drying, loculicidally dehiscent, the orifice of the pericarp appearing gaping and bilabiate within the calycine cup, the latter arising slightly below the rounded apex of the pericarp, extending for ca. 1.5 mm, to 5 mm broad; seeds numerous, oblong to hemispherical, compressed, ca. 0.2 mm long, reticulate.

Elaeagnia nitidifolia is known only from Panama but is to be expected in the Dept. Choco, Colombia. The present distribution in Panama is noteworthy: Cerro Jefe and the Panama-Colombia frontier. A study of "mountain hopping" species such as the present one will provide an interesting study as far as the Republic of Panama is concerned. It appears to be closely related to the Venezuelan species *E. ruiz-teranii* Steyermark, which differs in having much larger leaves and a ciliolate calyx. Steyermark's species[44] has the calyx dentate, while the flowers in

[44] See Fig. 65, p. 406, Flora de Venezuela, primera parte.

the new species, as observed on *Correa et al. 1608*, are toothless. The other collection from Panama, *Gentry & Mori 13785*, which is in fruit, shows the persistent calyx cup usually deeply split; this I regard as a product of the fruit's maturation.

DARIÉN: Serrania del Darién, Panamá-Colombia border, Cerro Mali base camp, 1500 m, *Gentry & Mori 13785* (MO). PANAMÁ: Cerro Jefe, 1000 m, *Correa et al. 1608* (MO).

36. EXOSTEMA

Exostema Rich., H. & B., Pl. Aeq. 1: 131. 1808. TYPE: *E. parviflorum* Richard.

Solendra Hook. in Benth. & Hook., Gen. Pl. 2: 12, 43, 1873, not *Solenandria* P. Beauv. ex Ventanat (1803). TYPE: *S. ixoroides* J. D. Hooker.
Steudelago Kuntze, Rev. Gen. Pl. 298. 1891. Substitute name for *Solenandra* Hooker, 1873.

Shrubs or trees. *Leaves* petiolate or subsessile; stipules entire or bifid, often persistent. *Inflorescences* terminal, paniculate or corymbose, flowers occasionally solitary and axillary (not Panama spp.); bracteoles present or absent. *Flowers* pedicellate, calyx 4–5-lobate, the lobes often narrow; corolla usually elongate, the lobes (4–)5, usually elongate and narrow with 2 exterior in bud; stamens 5, usually exserted, the filaments linear, connate at the very base and appearing free of the tube; ovarian disc annular, the style slender, usually exserted, the capitate stigma entire or 2-lobed, the ovules numerous, the placentas peltately adnate to the septum. *Fruits* capsular, 2-celled and 2-valvate, septicidally dehiscent with each valve entire or bivalvate; seeds usually numerous, imbricate, the body oblong, compressed, the testa membranous, produced into a wing.

Exostema occurs in Mexico, Panama and south to Peru; it also is found in the West Indies.

1. **Exostema mexicanum** A. Gray, Proc. Am. Acad. Arts 5: 180. 1861. TYPE: México, *Ervendberg 125* (not seen).

Trees to 9.5 m tall or shrubs, the twigs terete, smooth, drying gray or gray green, lenticellate, glabrous, the nodes 5–7 cm apart. *Leaves* oblong, obovate oblong or widely ovate, 5.5–17 cm long, 2–9.5 cm wide, deltoid to obtuse at the apex, often tapering into a vague acumen or somewhat attenuate acuminate, the basal acumen to 1.5 cm long, ultimately obtuse, widely cuneate or rounded, occasionally truncate, the costa plane or immersed above, prominulous beneath, the lateral veins about 10, the intervenal areas spreading reticulate, chartaceous, glabrous above and beneath, often minutely pubescent in the axils beneath; petioles to 1.5 cm long, strict or curved, stout; stipules (fide Standley) 2.5–4 mm long, triangular, acuminate or long cuspidate. *Inflorescences* terminal and/or axillary, glabrous, thrysoid cymose, shorter than or occasionally as long as the uppermost leaves, the peduncles absent and then with 3 branches arising from the tip of the twig, or distinctly pedunculate, the peduncles 2–5 cm long, the branches few, well spaced, divergent, the first and second pairs opposite, the cymules terminal, disposed in a fan or brush-like pattern. *Flowers* white, short pedicellate; hypanthium oblong, ca. 2 mm long, glabrous or puberulent, the calycine cup scarcely measurable with patches of minute reddish glands within, the

FIGURE 37. *Exostema mexicanum* A. Gray.—A. Habit (×½).—B. Inflorescence (×½). [After *Dwyer & Elias 7510.*]—C. Flower (×2.5).—D. Stamens, opened (×2.5).—E. Ovary, opened to show ovules (×5).—F. Seed (×3). [After *Dwyer 8391.*]

calycine teeth 5–6, subequal, widely or narrowly subulate; corolla with tube curved, narrow cylindrical, 7–10 mm long, ca. 0.5 mm wide, petaloid, puberulent outside, glabrous within, the lobes 6, linear oblong, ca. 12 mm long, ca. 1.5 mm wide, obtuse, glabrous within; stamens 6, the anthers linear oblong, 3–4 mm long, basifixed, the filaments linear, to 16 mm long, free from corolla tube, attached basally in a ring, ca. 1 mm long; style cylindrical, linear, to 24 mm long, thicker above the middle, the stigmas clavate, ca. 0.6 mm long. *Fruits* septicidally bivalvate, each valve splitting medially, fusiform oblong or obovate oblong, to 12 mm

long, 3–4 mm wide before splitting, lignose, glabrous, white punctate lenticellate; seeds subfusiform, 7–9 mm long, 2–3 times longer than wide, membranous, the body plane, oblong rotund, ca. 2 mm in diam., the wing at 1 end subtriangular or oblong, obtuse, bifid at other end, the processes divergent, one oblong and obtuse, the other shorter, subtriangular and acute.

The species is known from Mexico, Guatemala, Belize, Honduras, El Salvador, and Panama.

CANAL ZONE: Madden Dam, *Dwyer & Elias 7502, 7508* (both MO), *7510* (MO, NY); *Dwyer 8391* (MO), *9164* (MO, NY); *Dwyer & Nee 11979* (MO). PANAMÁ: Vera Cruz, *Bristan P-19* (MO). Between Río Bayano dam and Cañitas, *D'Arcy 9385* (MO).

37. FARAMEA

Faramea Aubl., Hist. Pl. Guiane 1: 102. 1775. TYPE: *F. corymbosa* Aubl.

Trees or shrubs. *Leaves* often coriaceous; stipules usually entire, free or connate, usually awned, the base usually ovate triangular. *Inflorescences* terminal or axillary, often disposed as loose decussate panicles or umbellate cymes, ultimately cymose; bracts present or absent, occasionally with 2 large bracts at the base of the inflorescence; pedicels often stout, stiff. *Flowers* 4(–5)-merous, calycine cup truncate, teeth present or absent; corolla tubular or salverform, the lobes usually 4, valvate in bud, usually wider than the tube; pollen dimorphic; stigmas disposed as 2 filamentous or clavate lobes, ovary 2-celled, becoming 1-locular with the ovules collateral or connate at the apex of the incomplete septum. *Fruits* drupaceous, depressed oval to rotund, 1-seeded by fusion of the ovules; seed horizontal, usually with a deep ventral groove.

Faramea is well distributed in Central America and tropical South America. It also occurs in the West Indies. There are about 125 species in the genus.

a. Leaves conspicuously callose marginate.
  b. Leaves oval (rarely a few oblong oval), 4–9 cm long, acuminate, the acumen less than 0.9 cm long ..... 10. *F. ovalis*
  bb. Leaves oblong or obovate oblong, 10–15 cm long, cuspidate, the acumen 1–1.5 cm long ..... 8. *F. luteovirens*

aa. Leaves not callose marginate.
  c. Leaves with 2 submarginal veins.
    d. Leaves 3–7 cm long; flowers ca. 4 per inflorescence ..... 17. *F. woodsonii*
    dd. Leaves 7–30 cm long; flowers many per inflorescence.
      e. Leaves not glaucescent or pruinose beneath; calycine teeth obsolete.
        f. Leaves oblong, ovate oblong or elliptic, 4–7(–10.5) cm wide; calycine cup minute; corolla white, blue or deep purple ..... 14. *F. suerrensis*
        ff. Leaves narrowly elliptic, to 3.5 cm wide; calycine cup ca. 2 mm long; corolla bluish white ..... 13. *F. scalaris*
      ee. Leaves glaucescent or pruinose beneath; calycine teeth to 1 mm long ..... 3. *F. bullata*

  cc. Leaves with 1 distinct submarginal vein or lacking a submarginal vein.
    g. Leaves bullate ..... 11. *F. papulata*
    gg. Leaves not bullate.
      h. Leaves with lateral veins 6–9; inflorescence racemose .. 2. *F. bocataurensis*
      hh. Leaves with lateral veins 10–20; inflorescence not racemose.
        i. Stipules 2.5–3 cm long; leaves with lateral veins ca. 20.
          j. Stipules free; inflorescence an ovate, blunt head ..... 4. *F. caput-anguis*
          jj. Stipules connate; inflorescence spreading.

k. Calycine teeth absent; calycine cup ca. 0.6 mm long ..... 16. *F. terreyeae*
kk. Caylcine teeth ca. 0.5 mm long; calycine cup ca. 1.5 mm long ..... 6. *F. jefensis*
ii. Stipules 0.3–2 cm long; leaves with lateral veins 10–19.
l. Leaves oval or suboval ..... 10. *F. ovalis*
ll. Leaves not oval but elliptic or oblong.
m. Leaves with lateral veins 14–17.
n. Calycine cup ca. 0.3 cm long; corolla tube ca. 15 mm long; anthers ca. 4 mm long; stipules ca. 0.4 cm long ..... 1. *F. altipetens*
nn. Calycine cup 1–1.2 cm long; corolla tube 25–30 mm long; anthers ca. 8 mm long; stipules 1–1.5 cm long ..... 12. *F. pauciflora*
mm. Leaves with lateral veins 8–13.
o. Corolla tube ca. 6.5 mm long; leaves drying emerald green ..... 7. *F. liesneri*
oo. Corolla tube 7–17 mm long; leaves not drying emerald green.
p. Anthers ca. 8 mm long ..... 9. *F. occidentalis*
pp. Anthers to 4 mm long.
q. Corolla tube 12–17 mm ..... 15. *F. talamancarum*
qq. Corolla tube 7–11.5 mm long.
r. Inflorescences ca. 4-flowered; leaves 3–7 cm long ..... 17. *F. woodsonii*
rr. Inflorescences many-flowered; leaves 5–16 cm long ..... 5. *F. eurycarpa*

1. **Faramea altipetens** Dwyer.[45] TYPE: Panama, *Gentry & Mori 14013* (MO, holotype).

Trees to 4 m tall, the branchlets smooth, glabrous, plano compressed, twisted, the nodes well spaced. *Leaves* oblong lanceolate, 11–17.5 cm long, 3–5.5 cm wide, rounded or obtuse toward the apex, caudate acuminate, the acumen to 1.2 cm long, ultimately obtuse, basally cuneate, usually lightly inequilateral, the costa subplane to prominulous on both sides, the lateral veins ca. 14, widely arcuate, dull yellow, the submarginal vein undulate, to 3 mm from the margin, the intervenal areas conspicuously reticulate, the smallest veinlets conspicuously prominulous, coriaceous, concolorous, dark yellow or yellow brown when dry, glabrous; petioles ca. 1 cm long, rigid, stipules free, ovate triangular ca. 0.4 mm long, lacking terminal setas. *Inflorescences* terminal, solitary, glabrous, paniculate, to 9 cm long, to 10 cm wide; peduncles to 3 cm long, terminated by 4–5 branches, these radiately disposed, each branch with 1–2 pairs of opposite, angular ascending branchlets terminated by 1–2 few-flowered cymules; pedicels 2–5 mm long, drying black. *Flowers* glabrous; hypanthium ca. 1 mm long; calycine cup narrowly cylindrical, to 4 mm long, eglandular within, truncate at the apex, often undulate, the margin occasionally with shallow notches, teeth absent; co-

[45] *Faramea altipetens* Dwyer, spec. nov. *Arbores* ad 4 m altae, ramulis glabris ultime tortis. *Folia* oblongo-lanceolata, venis lateralibus ca. 14 interveniis conspicue reticulatis venulis minimis prominulis; stipulis ca. 0.4 mm longis. *Inflorescentiae* terminales solitariae, pedunculis 4–5 ramis radiate dispositis terminatis ramo utroque 1–2 jugis ramulorum oppositorum cymulis paucis. *Flores* glabri; corolla alba tubo ca. 15 mm longo, lobis 4 ad 7 mm longis; antheris subsessilibus, ca. 4 mm longis. *Fructus* non visi.

rolla white, the tube narrowly cylindrical, ca. 15 mm long, the lobes 4, crassate, triangular subulate, to 7 mm long; stamens included, 4, the anthers subsessile, linear ovate, ca. 4 mm long, minutely apiculate, inserted near the middle of the corolla tube; style ca. 9 mm long, the stigmas 2, slender, ca. 2 mm long. *Fruits* not seen.

Faramea altipetens is known only from Panama but is to be expected in nearby Colombia. It is marked by the combination of short stipules and anthers and a relatively elongate corolla tube. The smallest veinlets are prominulous with the intervenal areas having a striking reticulate appearance. It is closely related to *F. pauciflora* Dwyer in which the flowers are white and few, ca. 3 per cyme. *F. pauciflora,* however, has much larger stipules, corolla tube, and anthers.

DARIÉN: Cerro Tacarcuna, 1500 m, *Gentry & Mori 14013* (MO).

2. **Faramea bocataurensis** Dwyer.[46] TYPE: Panama, *Kirkbride & Duke 806* (MO, holotype).

Small *trees,* to 5 m tall, the branches smooth, glabrous, the nodes well spaced. *Leaves* lanceolate, 6–11.5 cm long, 2–2.7 cm wide, acute at the apex, acuminate, the acumen to 2 cm long, ca. 0.15 cm wide in the middle, acute or subobtuse at the base, the costa prominulous, the lateral veins 6–9, arcuate, prominulous, with 1–4 smaller veins between a pair of adjacent veins, these subparallel but soon branching, the intervenal areas spreading reticulate, chartaceous, bicolorous, glabrous; petioles slender but stiff, ca. 0.5 cm long; stipules connate, the sheath cylindrical, ca. 0.7 cm long, stiffly petaloid, glabrous, each part with an awn 0.8 mm long. *Inflorescences* terminal, solitary, glabrous, to 3.5 cm long, epedunculate, cymose racemose, the branches to 5 mm long or absent, the cymules few flowered, bracteoles deciduous, subulate, 0.8–2 mm long; pedicels ca. 4 mm long. *Flowers* purple, glabrous; hypanthium subrotund, ca. 0.5 mm long, the calycine cup turgid, to 0.35 mm wide, smooth, petaloid, eglandular within, with 4 subulate lobes, to 0.8 mm long; corolla (only one seen in bud) to 7.5 mm long, the tube cylindrical, rigidly carnose, to 6 mm long, ca. 1 mm wide toward the base, the lobes 4, narrowly ovate lanceolate, ca. 2 mm long; stamens 4, the anthers narrowly oblong, ca. 4 mm long, obtuse and subsagittate at the base, the filaments slender, ca. 1 mm long, affixed near the middle of the tube, the disc of the ovary to 1.3 mm long, 3 times longer than wide, the style linear, ca. 6 mm long, the stigmas 2, narrowly oblong, ca. 1 mm long. *Fruits* not seen.

Faramea bocataurensis is known only from Panama. While the flowers are known only from the bud stage, the calycine cup is remarkably short as are the

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[46] *Faramea bocataurensis* Dwyer, spec. nov. *Arbores* parvae ad 5 m altae. *Folia* lanceolata, 6–11.5 cm longa, 2–2.7 cm lata, apice acuta caudato-acuminata, acumine ad 2 cm longo, basi acuta vel subobtusa, venis lateralibus 6–9; petiolis ca. 0.5 cm longis; stipulis connatis vagina cylindrica, ca. 0.7 cm longa, parte utraque seta ad 0.8 mm longa. *Inflorescentiae* terminales solitariae glabrae, ad 3.5 cm longae, epedunculatae cymoso-racemosae ramis solum 3–4 mm longis vel nullis, cymulis floribus paucis praeditis; bracteolis saepe deciduis, subulatis, 0.8–2 mm longis. *Flores* glabri; pedicellis ca. 4 mm longis, cupula calycis turgida, ad 0.35 mm lata, ca. 0.5 mm longa, dentibus 4, ad 0.8 mm longis; corolla purpurea, ad 7.5 mm longa; antheris lineari-oblongis, ca. 4 mm longis. *Fructus* non visi.

calycine teeth. The leaves are as narrow as any species of Panamanian *Faramea* and have the fewest lateral veins. The reduced racemelike inflorescence is noteworthy.

BOCAS DEL TORO: E slope of La Zorra to divide, *Kirkbride & Duke 806* (MO).

3. **Faramea bullata** Standley, Field Mus. Nat. Hist., Bot. Ser. 4: 294. 1929. TYPE: Panama, *Cooper 507* (F, holotype; NY, isotype).

Trees or shrubs, 2–4.5 m tall, glabrous, the branchlets smooth, the nodes well spaced. *Leaves* oblong, 15–21.5 cm long, 5.5–7 cm wide, acuminate, the acumen ca. 2 cm long, basally cordate or occasionally rounded, the costa prominent, the lateral veins ca. 15, immersed above, with 1–2 somewhat irregular intermediate veins between pairs of lateral veins, the submarginal veins 2, the outermost ca. 1.5 mm from the margin, the other ca. 5 mm from the margin, subcoriaceous, shiny green above, bullate, glaucescent and pruinose beneath; petioles ca. 0.5 cm long, glabrous; stipules presumably connate basally, each part oblong rotund, ca. 8 mm long, tapering acutely toward the apex, the awn subulate, to ⅓ the length of the sheath, coriaceous, glabrous. *Inflorescences* cymose paniculate, to 7.5 cm long, often almost as wide as long; peduncle thick or slender, to 3 cm long, the branches few, angular ascending; pedicels 2–6 mm long. *Flowers* with hypanthium and calycine cup short, the teeth triangular or subulate, to 1 mm long; corolla blue or bluish white, the tube ca. 9 mm long, ca. 1.2 mm wide in bud. *Fruits* compressed rotund, to 1.5 cm wide, smooth, ca. twice as long as wide, drying black, smooth, glabrous; "seed gray, deeply and narrowly exsculpate at the base, smooth, ca. 1 cm long" (fide Standley).

Faramea bullata is known only from Panama. In preparing the above description I have drawn freely from Standley's original description.

BOCAS DEL TORO: Kankintoe, 10 mi above Holstein near Almirante, *Cooper 507* (F, NY, US). Punta Peña, Chiriquicito, *Lewis et al. 2145* (F, MO). VERAGUAS: Caribbean slope above Río Primero Brazo, 5 mi NW of Santa Fé, *Liesner 965* (MO).

4. **Faramea caput-anguis** Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 39. 1968. TYPE: Panamá, *Dwyer & Gauger 7375* (MO, holotype).

Trees to 8 m tall, the branchlets smooth, drying black and glabrous, the internodes to 7 cm long. *Leaves* oblong, to 26 cm long, to 12 cm wide, acute or acuminate at the apex, the acumen to 1.5 cm long, acute at the base, the costa subplane above, prominent beneath, the lateral veins ca. 20, arcuate, prominent, 1–2 cm apart, the venules pinnatiform, thin coriaceous, often yellow green beneath, minutely yellow puberulent; petioles 2–4 cm long, smooth; stipules persistent, triangular, to 3 cm long, to 0.8 cm wide, acute, lignose, glabrate. *Inflorescences* usually 1 per axil; peduncles divergent, stiff, smooth, glabrous, expanding terminally, to 9 cm long; heads ovoid, apically blunt, solitary, cymose, at first gemmiform and fusiform oblong, to 2 cm long, ca. 1 cm wide, the outer bracts ca. 5, widely fusiform oblong, glabrous, foliose; flowers 7–9 per head, each

pair with 2 to several bracteoles. *Flowers* glabrous, the calyx narrowly campanulate, to 8 mm long, the lobes 4, unequal, subulate, the shorter lobes ca. 4 mm long, the longer lobes ca. 8 mm long; corolla white, tube ca. 25 mm long, narrow medially, dilated above, the lobes 4, lanceolate, to 7 mm long, acute; stamens 4, the anthers linear oblong, ca. 5.5 mm long, the filaments affixed near the middle of the tube; ovules orbicular. *Fruits* oblong, to 1.5 cm long, to 1 cm wide including persistent calyx, smooth, glabrous, glandular shiny, drying black, the calyx 2–5 mm long.

Faramea caput-anguis is known only from Panama.

PANAMÁ: Cerro Jefe, *Busey 791* (MO). La Eneida, Cerro Jefe, *Correa & Dressler 954, 1120* (both MO). Cerro Jefe, *Dwyer et al. 7248* (MO); *Dwyer & Gauger 7375, 7388A* (both MO); *Dwyer et al. 8236* (MO). 9.4 km N of Goofy Lake, 900 m, *Folsom et al. 1963A* (MO). Cerro Jefe, *Luteyn & Foster 1140* (MO).

5. **Faramea eurycarpa** Donnell Smith, Bot. Gaz. 44: 113. 1907. TYPE: Costa Rica, *Tonduz 12880,* not seen.

F. platycarpa Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 140. 1967. TYPE: Ecuador, *Owenby 2711* (MO, holotype).

Trees to 4 m tall, the ultimate branchlets becoming angular, smooth, glabrous, the nodes well spaced. *Leaves* oblong or oblanceolate, 5–16 cm long, 1.5–5.5 cm wide, rounded or obtuse at the apex, rarely cuneate, contracted into a slender acumen, the acumen to 1.3 cm long, ultimately obtuse, basally cuneate to obtuse, rarely truncate or auriculate, often inequilateral, the costa prominulous, the lateral veins ca. 13, at first nearly perpendicular, then widely arcuate, united to form a distinct undulate submarginal vein, to 0.3 cm from the margin with 1–2 smaller veins between 2 lateral veins, the intervenal areas spreading reticulate, chartaceous to papyraceous, concolorous, glabrous, the margins delicately revolute; petioles slender to stout, to 0.5 cm long, glabrous; stipules connate, the 1 at the twig tip dome shaped, to 6 mm long, the awn shorter than the body, the inferior stipules more cylindrical, to 7 mm long, the sheath separating above into 2 triangular parts, each with an awn ca. 2 mm long, glabrous. *Inflorescences* terminal, solitary, oblong rotund to subcuneate, to 9 cm long, to 9 cm wide, paniculate, the peduncle 2–5 cm long, the lowermost branches opposite, to 3 cm long; the upper branches disposed as 2–3 pairs, usually opposite, the branchlets terminating in a fan of few-flowered cymules. *Flowers* with pedicels ca. 1 cm long, stiff; hypanthium ca. 0.75 mm long, glabrous, the calycine cup compressed cup shaped, shorter than the hypanthium, scarious and eglandular within, the teeth 4–5, irregular, unequal, triangular or subulate, to 0.8 mm long, acute; corolla purplish or white with a purplish apex, narrowly cylindrical, to 1 cm long, glabrous, carnose; corolla lobes 4, ovate, to 3 mm long, occasionally slightly acuminate; stamens subsessile, the anthers 4, narrowly oblong, 3–4 mm long, minutely apiculate, attached near the middle of the tube; style slender, ca. 8 mm long, the stigmas fingerlike, slightly unequal, to 1 mm long, scarcely wider than the style. *Fruits* drying black, bright blue, compressed rotund, wider than long, to 1.3 cm wide, smooth, glabrous, the calycine scar ringlike, scarcely elevated.

Faramea eurycarpa is known from Costa Rica and Panama. It is also known from Colombia and Ecuador. *Leon 537* (MO) from the Dept. Choco, Colombia, seems to be *F. eurycarpa*, although it reaches 10 m in height, has a strongly contracted inflorescence, and stipules to 1 cm. *Forero et al. 3073* (MO), also from Dept. Choco, superficially resembles *F. eurycarpa* but has corolla lobes to 15 mm in length.

COCLÉ: La Mesa, *Dwyer 8318* (MO). COLÓN: Santa Rita Ridge, *Dwyer 8554* (MO). DARIÉN: 1–3 mi N of Paya, *Duke 14005* (MO). PANAMÁ: Cerro Campana, *Allen 1877* (F, MO, US); *Correa & Dressler 291* (MO); *Croat 14217, 17240, 22779* (all MO); *Duke 10737* (MO, OS); *Dwyer et al. 4718* (MO); *Gentry 1831* (MO, NY), *4904, 4952* (both MO); *Kirkbride & Hayden 277* (MO, NY); *Kirkbride 337* (MO, NY); *Lewis et al. 3049* (MO, SCZ, UC, VEN). El Llano-Cartí Road, 21.1 km from Panamerican Highway, *Mori & Kallunki 5112* (MO). El Llano-Cartí Road, 11–12 km from Panamerican Highway, *Mori et al. 6885* (MO). Cerro Campana, *Mori & Bolten 7703* (MO). El Llano-Cartí Road, 16 km N of Panamerican Highway, *Nee & Dressler 9356* (MO). El Llano-Cartí Road, *Nee et al. 8769* (MO). Cerro Campana, 825–1000 m, *Nee & Stockwell 11581* (MO); *Porter et al. 4162* (COL, DUKE, MICH, MO, NY, SCZ, UC, VEN).

6. **Faramea jefensis** Dwyer & Hayden, Phytologia 15: 56. 1968. TYPE: Panamá, *Tyson et al. 3396* (MO, holotype; NY, isotype).

Trees or shrubs, the branchlets strongly arcuate, ultimately angular, black when dry, the nodes somewhat turgid, the internodes to 5 cm long, minutely ciliolate. *Leaves* narrowly elliptic, 9–15 cm long, 2–5 cm wide, long cuspidate, the cusp to 1.5 cm long, ca. 1.5 mm wide, basally cuneate, often inequilateral, the costa prominulous above and beneath, the lateral veins ca. 20, scarcely arcuate, delicately prominulous beneath, the submarginal vein irregular undulate, ca. 3 mm from the margin, thin coriaceous, concolorous or discolorous, drying a dull yellow beneath, glabrous, the margin scarcely thickened; petioles to 0.8 cm long; stipules connate, cylindrical, ca. 2.5 cm long, the sheath separating into 2 triangular parts ca. ½ the length of the sheath, minutely puberulent. *Inflorescences* rarely reduced to a single flower, usually cymose thrysoid, to 2.5 cm long, to 3 cm wide, the peduncle scarcely developed, crassate, ca. 3 mm wide, the branches few, to 1.5 cm long, ascending; bracts foliaceous, enclosing the juvenile inflorescence, ovate, 2–4 cm long, 1–2 cm wide, cuspidate, glabrous, variegated medially, the margins green; pedicels to 3 mm long. *Flowers* with the hypanthium and calyx to 6 mm long, glabrous, the calycine cup cupular, to 1.5 mm long, ca. 2 mm wide, the teeth 4, minute; corolla dark blue, the tube cylindrical, 9–12 mm long, the lobes 4, crassate, triangular in cross section, to 8 mm long; stamens 4, the anthers 3.5–4 mm long, inserted below the middle of the corolla tube; style ca. 8 mm long, the stigmas linear, ca. 2 mm long, erect, minutely papillate. *Fruits* sessile or subsessile, compressed rotund, 0.3–0.5 cm long, 1–1.6 cm wide, smooth, glabrous, drying black or yellow, the calycine cup scar annular, ca. 2 mm wide.

Faramea jefensis is known only from Panama.

PANAMA: 6 miles above Goofy Lake, road to Cerro Jefe, *Croat 15222* (MO). Cerro Jefe, 2900 ft, *Dwyer et al. 7279* (MO); *Dwyer & Gauger 7328* (GH, MO, NY), *7338A* (MO); *Foster & Kennedy 1875* (MO); *Tyson et al. 3396* (MO).

7. **Faramea liesneri** Dwyer.[47] TYPE: Panamá, *Busey 913* (MO).

Shrubs to 3½ m tall, the branchlets terete, smooth, glabrous, ultimately angular, the nodes well spaced. *Leaves* oblong, 4.5–9.5 cm long, 1.3–4 cm wide, obtuse or widely deltoid at the apex, acuminate, the acumen often barely discernible, ultimately obtuse, basally acute, the costa prominulous above, the lateral veins ca. 13, perpendicular to the costa, forming an undulate submarginal vein ca. 1.5 mm from the margin, the margin lightly revolute, subcoriaceous, glabrous, concolorous, drying emerald green or whitish green; petioles to 0.8 cm long, rigid, glabrous; stipules connate, glabrous, with each part oblong rotund, to 4 mm long, with a median keel continuing into a terminal rigid bristle shorter or longer than the body, coriaceous. *Inflorescences* terminal or axillary, umbelliform, to 6 cm long, 1.5–4 cm wide, glabrous, the peduncle 1–2.5 cm long, the cymes radiately disposed; pedicels slender, 0.5–1 cm long. *Flowers* with the hypanthium oblong rotund, to 1.2 mm in diam., the calycine cup much reduced, truncate, erose and minutely puberulent marginally, the lobes inconspicuous, to 0.3 mm long, truncate or obtuse; corolla violet blue, the tube narrowly cylindrical, 5–6.5 mm long, ca. 0.1 cm wide, thin carnose, glabrous inside and out, the lobes 4, unequal, narrowly oblong, to 6 mm long, to 2 mm wide, obtuse, glabrous; stamens 4, the anthers oblong, ca. 3 mm long, obtuse, attached above the middle of the tube; style linear, to 2.5 mm long, the stigmas 2, to 0.8 mm long, ovarian disc to 0.6 mm long, rounded. *Fruits* on pedicels to 1.5 cm long, equal in length, slender, radially disposed, the pedicel scars obvious, ringlike, the bracteoles few, stipulelike, the body of the fruit round to compressed rotund, ca. 0.5–1.2 cm in diam., smooth, glabrous, often emerald green when dry, the calycine cup small.

Faramea liesneri is known only from Panama. It is named in honor of Ronald Lee Liesner, Missouri Botanical Garden, who has contributed much to our knowledge of the flora of Panama. It is closely related to *F. woodsonii* Standley, a small-leafed species, which has only stiffly chartaceous leaves and has a much reduced inflorescence in which the flowers number about four. *Faramea liesneri* has stiffly coriaceous leaves which dry a striking emerald green. This, coupled with a much reduced, marginally pubescent calycine cup, as well as much reduced calycine lobes, serves to distinguish the new species.

PANAMÁ: Road to Cartí, 8–19 km N of El Llano, 350–500 m, *Busey 913* (MO); *Folsom et al. 1495* (MO); *Mori 7733* (MO); *Mori & Kallunki 2265, 2889* (both MO).

8. **Faramea luteovirens** Standley, Contr. U.S. Natl. Herb. 18: 138. 1916. TYPE: Panamá, *Pittier 4038* (US, holotype).

Trees to 10 m tall, the twiglets smooth, shiny, terete, finally angular, glabrous,

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[47] *Faramea liesneri* Dwyer, spec. nov. *Frutices* ad 2 m alti. *Folia* oblonga, 4.5–9.5 cm longa, 1.3–4 cm lata, acumine brevi, venis lateralibus ca. 15, subcoriacea glabra in sicco smaragdina vel albido-smaragdina; petiolis ad 0.8 cm longis; stipulis connatis glabris parte utraque oblongo-rotunda, ad 4 mm longis, in medio carinata seta rigida quam vagina breviori vel vix longiori. *Inflorescentiae* terminales vel axillares, ad 6 cm longae, umbelliformes cymis radiate dispositis. *Flores* pedicellis 0.5–1 cm longis; cupula calycis brevissima lobis inconspicuis, ad 0.3 mm longis; corolla tubo angusto-cylindrico, 5–6.5 mm longo, lobis 4, ad 6 mm longis; antheris ca. 3 mm longis. *Fructus* ca. 0.5 cm diam., smaragdini.

the nodes well spaced. *Leaves* oblong, obovate oblong, oblong rotund, to 15 cm long, to 8 cm wide, obtuse, rounded or truncate at the apex, cuspidate, the cusp to 1.5 cm long, often falcate, cuneate to acute, rarely truncate at the base, equilateral, the costa plane to prominulous above, prominent beneath, the lateral veins 10–13, widely arcuate, prominulous above and beneath, the intervenal areas reticulate, the veinlets often disappearing, the margin conspicuously thickened, coriaceous, glabrous, concolorous or discolorous, usually drying lemon yellow; petioles stiff, to 1 cm long, glabrous; stipules appressed, deltoid to compressed hemispherical, 2–4 mm long, the awn subulate, 3.5–5.5 mm long, coriaceous, glabrous. *Inflorescences* axillary or occasionally terminal, the peduncle usually suppressed (or if present to 2 cm long), branches few or absent, the flowers 1–2 per axil; pedicels strongly ascending, to 5 cm long, stiff, lignose, glabrous, expanded at the apex. *Flowers* with hypanthium oblong, ca. 9 mm long, coriaceous, glabrous, the calycine cup ca. 4 mm long with patches of minute appressed glands within, these covered with a membranous "skin," the calycine teeth absent, the margin undulate; corolla white, the tube narrowly cylindrical, falcate, ca. 2.2 cm long, ca. 4.5 mm wide medially, contracted below the middle, stiffly petaloid or subcoriaceous, glabrous, the lobes 3–4, lanceolate, 2.2–3.0 cm long, ca. 4.5 mm wide at the base, obtuse, coriaceous, glabrous, the margins deeply infolded; stamens 4, narrowly oblong, ca. 10 mm long, ca. 1.3 mm wide, obtuse, the filaments slender, dorsifixed, ca. 4 mm long, inserted on the lower ⅓ of the corolla tube; stigmas 2, erect, linear, to 2.2 mm long, the style slender, ca. 22 mm long, ca. 0.35 mm wide, the ovary thick walled. *Fruits* subglobose, 8–1.5 cm in diam., crowned with a calycine cup, smooth, glabrous, drying black.

Faramea luteovirens is known from Panama and Colombia. The label on *Duke 10055* indicates that the flowers turn maroon. "Huesito" *Duke 14241*.

CANAL ZONE: Old Fort Lorenzo, *Croat 15411* (MO). Fort Sherman, *Dwyer 7180* (MO). Pipeline Road, vicinity of Río Mendoca, *Gentry 7469* (MO). Fort Lorenzo, *Johnston 1514* (MO). Road to Battery VII, *Johnston 1662* (MO). Río Petitpie, Fort Sherman to Gatún Locks, *Mori & Kallunki 2701* (MO). Headwaters Río Providencia, *Nee & Gentry 8656* (MO). Gatún, *Standley 27177* (MO). Fort Sherman, *Standley 31006* (US, S); *Tyson & Dwyer 1187, 1189* (both MO). Fort San Lorenzo, *Tyson 2230* (MO). BARRO COLORADO ISLAND: *Croat 5217, 6725* (both MO). CHIRIQUÍ: 4.1 mi from Boquete, Road to David, *Kirkbride 102A* (MO). Cano Quebrado, *Pittier 6664* (US). COLÓN: Near home of P. H. Zimmerman, Achiote, *Folsom et al. 3326* (MO). Loma de la Gloria, Fató, *Pittier 4038, 4098* (both US). DARIÉN: Río Tuira and Río Paca, *Duke 5024* (MO). Asnatí, *Duke 10055* (MO). Piñas, *Duke 10603* (MO). Near Estero Grande off Río Maresa, *Duke 10954* (MO). Río Perrecénega and Rancho Frío, *Duke & Elias 13883* (MO). Mortí Hydro, Río Mortí, *Duke 14212, 14241* (both MO). La Palma, *Pittier 6697* (US). SAN BLAS: Isla Sokatupu, *Duke 8956* (MO). Playon Chico, *Stier 187* (MO). Isla Pino, near Mulatupo, *Elias 1701* (GH, MO). Río Mulatupo, headwaters, *Elias 1764* (GH, MO). COLOMBIA: CHOCO: Municipio de Río Sucio, Parque Nal. Los Katvos. Camino Tilupo Via Alto Sautata, *Leon 536* (MO).

9. **Faramea occidentalis** (L.) A. Rich., Mém. Soc. Hist. Nat. Paris 5: 176. 1834.—Fig. 38.

Ixora occidentalis L., Syst. Nat. ed. 2: 893. 1759. TYPE: not seen.
Tetramerium odoratissimum DC., Prodr. 4: 496. 1830. TYPE: not seen.
Faramea zeteki Standley, Contr. Arnold Arbor. 5: 147. 1933. TYPE: *Woodworth & Vestal 641* (F, holotype).

Trees to 10 m tall, the branchlets terete, smooth, glabrous, ultimately angular. *Leaves* oblong or elliptic, occasionally ovate oblong, 8–20 cm long, 2.5–11 cm

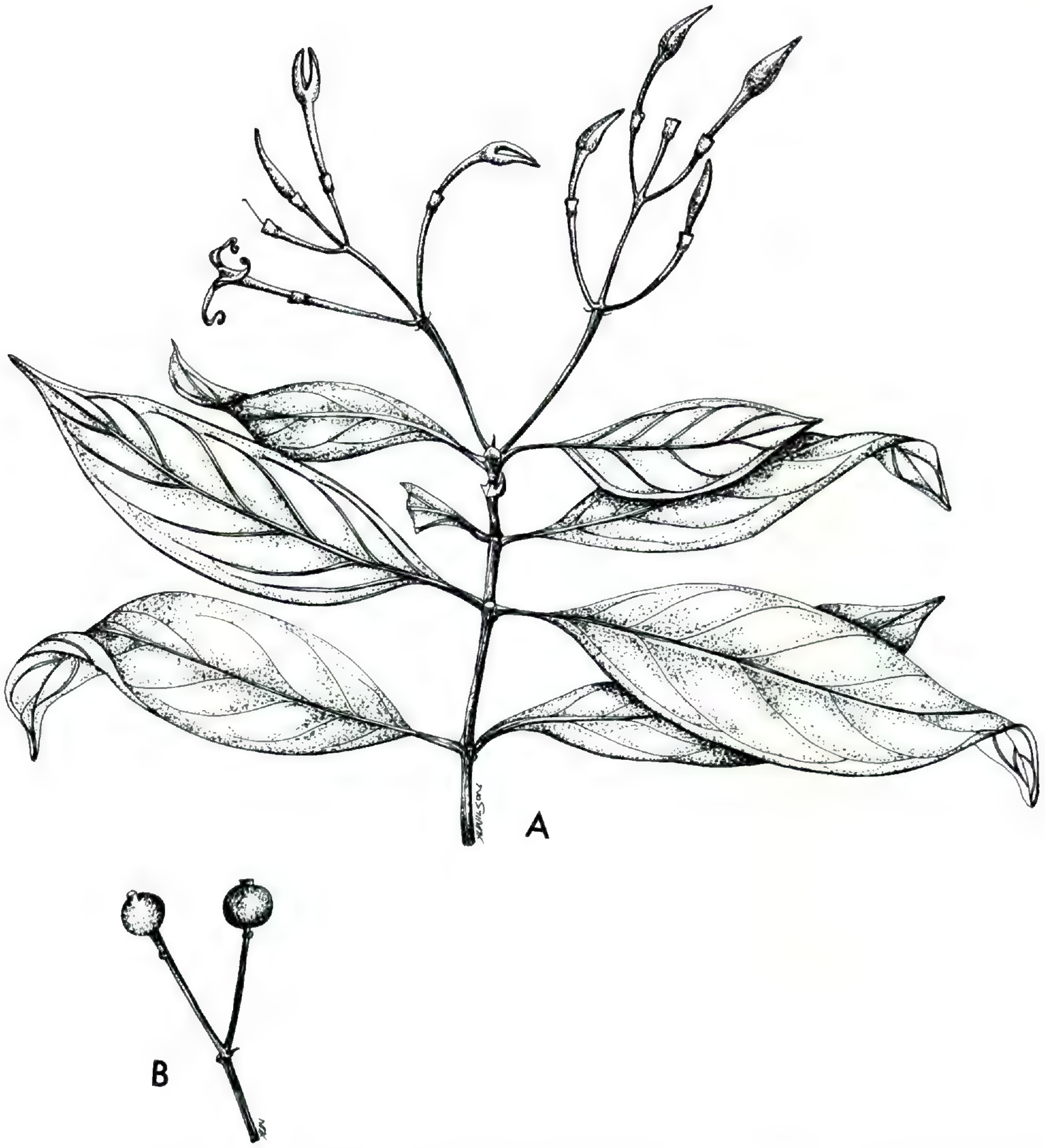

FIGURE 38. *Faramea occidentalis* (L.) A. Rich.—A. Flowering branch (×½). [*Stern et al. 24.*]—B. Fruit (×½). [After *Stimson 5385.*]

wide, rounded or obtuse at the apex, acuminate, basally cuneate or truncate, the costa subplane to prominulous above, prominulous to prominent beneath, the lateral veins 8–10, widely arcuate, usually with 1–5 irregular and soon evanescent veinlets between adjacent lateral veins, the intervenal areas spreading reticulate, slightly marginate, papyraceous to thin coriaceous, glabrous above, sometimes sparsely pubescent on the veins beneath; petioles stiff, often twisted, to 1.5 cm long, to 0.2 cm wide, glabrate; stipules widely deltoid, 1–2 cm long, 0.5–0.8 cm wide at the base, the terminal awn linear, about the same length or twice the length of the body, glabrous. *Inflorescences* terminal, occasionally axillary, paniculate, spreading, shorter than the terminal leaves, glabrous, the peduncle occasionally absent, mostly 1–2.5 cm long, the primary branches usually 2(4), either strongly ascending or the branches strict arcuate, divergent or deflexed, the cy-

mules few, sparsely flowered; pedicels 1–2 cm long. *Flowers* with the hypanthium oblong or rounded, the calycine cup cylindrical, ca. 2.2 mm long, stiffly carnose, glabrous with scattered glands within, these oblong, ca. 0.1 mm in diam., the teeth absent or evanescent; corolla white, the tube narrowly cylindrical, 1.7–2.2 cm long, carnose, glabrous, the lobes 4, lanceolate or ovate lanceolate, 1.1–1.8 cm long, ca. 0.45 cm wide; stamens 4, the anthers barely exserted, narrowly oblong, ca. 8 mm long, 0.8 mm wide, minutely apiculate, versatile, the filaments slender, ca. 2 mm long, inserted ca. 5 mm below the corolla mouth; ovarian disc prominent, ca. 0.5 mm long, the style slender, as long as the corolla tube or less than ¼ the length, the stigmas 2, slender, erect, 2.5–5.5 mm long, obtuse, the ovarian wall very thick. *Fruits* rotund or occasionally compressed rotund, often wider than long, to 1.3 cm in diam., crowned with a cylindrical calycine cup, to 2 mm long, glabrous, drying black.

Faramea occidentalis ranges from southern Mexico to Panama; it also occurs in the West Indies and throughout tropical South America. "Huesito," "Benjamin," "Palo Escrito" (*Howell 119*).

CANAL ZONE: Piña, near Waterways Exp. Sta., *Duke 9252* (MO). Gatún, *Dwyer 1781* (MO). George Greene Memorial, Las Cruces Trail, *Dwyer & Elias 7522* (MO, UC). Boy Scout Road, Madden Dam, *Dwyer 11974* (MO). Obispo, *Hayes 66* (BM). Pipeline Road, 4 km NW of Gamboa, *Nee 7076* (MO). Road S-8, Quebrada La Furnia, 1.5 km SW of mouth of Chagres River, *Nee 8636* (MO). Río Indio de Gatún, *Pittier 2783* (BM, US). Madden Forest, *Stimson 5385* (MO). Gamboa, *Tyson et al. 4571* (MO). Madden Lake, Boy Scout Camp, *Tyson 5446* (MO). BARRO COLORADO ISLAND: *Croat 4024A, 4131A, 6310, 6597, 9302, 14570, 14923, 14961, 14992, 17055* (all MO); *Dwyer 1407* (MO); *Knight 69-36* (MO); *Oppenheimer 66-11-2-0905, 66-10-20-0911, 66-8-28-1528, 67-1-17-1004* (all MO); *Foster 827* (MO); *Robyns 65-32* (MO); *Woodworth & Vestal 641* (F); *Zetek 3992* (MO). COLÓN: Río Culebra, *Pittier 4164* (US). COCLÉ: Lower Río Anton, near El Valle, 800–1000 m, *Allen 113* (MO). El Valle, *Alston 1849* (US). DARIÉN: Río Chico, *Allen 4640* (BM). Río Bayano above confluence with Río Chepo, *Duke 3979* (MO). 0–4 mi up Río Sabano, near Santa Fé, *Duke 4153* (MO). Río Tuira, 2 mi upstream from Boca de Cupe, *Duke 5380* (MO). El Llano, *Duke 5519* (MO). Without other locality, *Duke 8347* (MO). Río Chucunaque, between Río Membrillo and Río Subcutí, *Duke 8610* (MO). Near Estero Grande off Río Marea, *Duke 10958* (MO). Río Corso headwaters off Río Pacora, ca. 500 m, *Duke 11943* (MO). Quebrada Maskia at Río Pucro, *Duke 13099* (MO). Cativo Swamp near Tusijuanda, 1 day up Río Balsa from Manené, *Duke 13534* (MO). Tumagantí, ca. 300 m, *Duke 14155* (MO). Without other locality, *Duke 15787* (MO). 1–3 mi N of Paya, *Kirkbride & Duke 14013* (MO, US). Payita, *Stern et al. 248* (MO). Between Río Escucha Ruido & Río Tuira, *Stern et al. 576* (MO). 2 mi E of Santa Fé, *Tyson et al. 4673, 4807* (both MO). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11843* (MO). PANAMÁ: Bayano Cuipo Forest, 34.6 km E of Bayano Bridge, *Folsom 3533* (MO). Río Pasiga, first sharp bend, *Gentry 2263A* (MO). 6 km SW of Arraíjan, old road to Bique, *Nee 6901* (MO). El Llano-Cartí Road, 2.3 mi N of Panamerican Highway, ca. 250, *Nee & Dwyer 9242* (MO). Ríos Pacora & Corso to headwaters of Río Corso, *Oliver 2374* (MO, UC, VEN). Juan Diaz, *Standley 30581* (MO). Macapale Island, Madden Lake, *Tyson 5468* (MO).

10. **Faramea ovalis** Standley, Contr. U.S. Natl. Herb. 18: 138. 1916. TYPE: Panama, *Pittier 3159* (US, holotype; C, BM, isotypes).

Trees 3–13 m tall, the twiglets slender, the nodes well spaced, glabrous. *Leaves* small, oval, oblong rotund, or lanceolate, 4–9 cm long, 1.2–4.8 cm wide, rounded, obtuse, or cuneate at the apex, abruptly short acuminate, the acumen 0.3–1.0 cm long, cuneate to obtuse at the base, the lateral veins 6–12, widely arcuate, thin coriaceous, concolorous, glabrous, callose marginate; petioles to 1 cm long; stipules hemispherical, 3–9 mm long, the terminal awn longer than the body. *Inflorescences* to 5 cm long, to 4 cm wide, few flowered, the pedicels

umbelliform from the apex of a shorter peduncle. *Flowers* with the pedicels ca. 1 cm long; calycine cup undulate; corolla purplish or white, tinted pink, the tube ca. 12 mm long, the lobes 4–6 mm long. *Fruits* not seen.

Faramea ovalis is known only from Panama. The small, often oval leaves are unique among the *Faramea* of Central America. Only one other species of *Faramea* in Panama has strongly marginate leaf blades, *F. luteovirens* Standley. The notes on the type collection indicate "trunk straight, ca. 6 m, the crown pyramidal." *Davidson 530*, unlike the type, has lanceolate leaves. In addition the notes on the label indicate that it is 30–40 ft in height and has a corolla tube which is white and tinted pink. While these 3 differences from the type suggest that *Davidson 530* is a second species, I prefer to regard it as *F. ovalis*.

CHIRIQUÍ: Chiquero, Boquete District, 5500 ft, *Davidson 530* (MO). Cerro Horqueta, 1200–1700 m, *Pittier 3159* (BM, C, US).

11. **Faramea papulata** Dwyer & Hayden, Phytologia 15: 57. 1967. TYPE: Panamá, *Tyson et al. 2218* (MO, holotype).—FIG. 39.

Shrubs to 4 m tall, glabrous, the branchlets somewhat plane, the nodes well spaced. *Leaves* elliptic, 12–14.5 cm long, 5.5–7.5 cm wide, rounded at the apex, acuminate, the acumen 0.3–0.8 cm long, ultimately obtuse, basally rounded or widely cuneate, the costa prominent beneath, the lateral veins 10–12, arcuate, the submarginal vein conspicuous, ca. 0.5 cm distant from the margin, the intervenal areas prominent, coriaceous, shiny, bullate or papillate, bicolorous, occasionally drying yellow; petioles 1–1.5 cm long; stipules connate at the base, dimorphic, some small and compressed rotund, others elliptic, to 0.7 cm long, elongate cuspidate, the cusp to 0.25 cm long, the stipular scars to 0.4 cm long. *Inflorescences* terminal, umbelliform paniculate, 5.5–9 cm long, to 7 cm wide, the peduncle smooth, to 4.5 cm long, ca. 0.3 cm wide, the primary branches 4, equal, rigid, ascending sharply, the terminal branches ternately disposed, equal, the flowers often ternately disposed on each branchlet; pedicels to 4 mm long. *Flowers* with pedicels ca. 2 mm long, the hypanthium urceolate, ca. 1.2 mm long, black when dry; calycine cup crownlike, ca. 2.2 mm long (on immature fruit to 4 mm long), brown, the margin undulate, the teeth evanescent or to 0.1 mm long; corolla white and purple white, drying black, the tube narrowly cylindrical, to 13 mm long, scarcely expanded toward the apex, glabrous, thickly petaloid, the lobes 4, narrowly ovate triangular, to 13 mm long, carnose, glabrous; stamens 4, included, the anthers 4, oblong, to 5.3 mm long, the connective apically produced 1 mm, the filaments short, inserted below the middle of the corolla tube; ovules 2, hemispherical, the septum evanescent; style ca. 3 mm long, the stigmas finger like, ca. 1.8 mm long, scarcely wider than the style; ovarian disc ca. 1 mm long, drying black. *Fruits* rotund, to 0.5 cm in diam., smooth, glabrous, black when dry.

Faramea papulata is known only from the vicinity of Cerro Jefe, Province of Panama.

PANAMA: Cerro Jefe, *Dwyer & Hayden 4392* (MO). 9.4 km N of Goofy Lake, *Folsom et al. 1977* (MO). Cerro Jefe, *Mori 6521, 7991, 7998* (all MO); *Mori & Kallunki 3630* (MO); *Tyson et al. 2218, 3284, 3381* (all MO).

12. **Faramea pauciflora** Dwyer.[48] TYPE: Panama, *Croat 27575* (MO).

Trees to 4 m tall, the branchlets angular, twisted, somewhat smooth, the nodes well spaced. *Leaves* elliptic oblong, 15–19 cm long, 6–7.5 cm wide, rounded or obtuse at the apex, the acumen slender, to 1.5 cm long, ultimately obtuse, cuneate or acute at the base, the costa somewhat prominulous above, subprominent beneath, the lateral veins 14–17, arcuate, prominulous, forming an undulate marginal vein, rigidly papyraceous, somewhat discolorous, minutely puberulent on the veins and the costa; petioles to 1.5 cm long, ca. 0.13 cm wide, black when dry, minutely puberulent; stipules free, ovate triangular, to 1.5 cm long, 0.4–0.6 cm wide at the base, subcoriaceous, glabrescent, minutely rugulose, the apex drawn into a short bristle. *Inflorescences* axillary, the flowers 3 per cyme, or the flowers solitary; peduncle to 4 cm long, to 0.15 cm wide, black, glabrous; bracts and bracteoles not seen, perhaps regularly absent; pedicels perpendicular to the axis of the inflorescence or sharply ascending, to 4 cm long, ca. 0.1 cm wide, glabrous. *Flowers* with hypanthium similar to the pedicel but slightly expanded, glabrous, to 2.5 mm wide, the calycine cup cylindrical, to 1.2 cm long, to 0.5 cm wide, conspicuously truncate, the lobes 4, subulate, to 8 mm long, with 2 longer than the others, acute; corolla white, aromatic, the tube to 3 cm long, ca. 0.25 cm wide in the middle, expanded toward the apex, stiffly petaloid, glabrous on both sides, the lobes 4, these erect, narrowly subulate, to 1.3 cm long, to 0.35 cm wide, glabrous; stamens 5, sessile, narrowly oblong, ca. 8 mm long, obtuse at the apex, sagittate at base, inserted above the middle of the corolla tube; style not seen. *Fruits* not seen.

Faramea pauciflora is known only from Panama. It is readily distinguished by its few-flowered inflorescences, its elongate calycine lobes and corolla tube, and its elongate anthers.

VERAGUAS: Valley Río Dos Bocas, Road toward Escuela Agricola Alto Piedra and Calovébora, 450–550 m, *Croat 27575* (MO).

13. *Faramea scalaris* Standley, Contr. U.S. Natl. Herb. 13: 139. 1916. TYPE: Panama, *Pittier 3265* (US, holotype; isotypes F, NY).

Shrubs 4–6 ft tall, the branchlets smooth, glabrous, the nodes well spaced. *Leaves* sessile or subsessile, glabrous, narrowly elliptic, 5.5–15 cm long, 1.3–3.5 cm wide, tapering at the apex, acuminate, the acumen falcate, to 1.5 cm long, usually ultimately obtuse, basally cuneate to obtuse, the costa prominulous above and beneath, the lateral veins 8–13, perpendicular, scarcely arcuate, the inner submarginal vein more or less parallel to the margin, to 4 (–7) mm from the

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[48] *Faramea pauciflora* Dwyer, spec. nov. *Arbores* ad 4 m altae. *Folia* elliptico-oblonga, 15–19 cm longa, 6–7.5 cm lata, apice rotunda vel obtusa, acumine ad 1.5 cm longo, basi cuneata, venis lateralibus 14–17 rigido-papyracea in venis costaque minuto-puberula; petiolis ad 1.5 cm longis; stipulis liberis ovato-triangularibus, ad 1.5 cm latis, apice seta brevi praeditis. *Inflorescentiae* axillares floribus 3 in cymam unam dispositis, pedunculo ad 4 cm longo. *Flores* pedicellis ad 4 cm longis; cupula calycis ad 1.2 cm longa, truncata dentibus 4 subulatis, ad 8 mm longis, inaequalibus; corolla alba, tubo ad 3 cm longo, lobis 4 ad 1.3 cm longis; antheris sessilibus angusto-oblongis, ca. 8 mm longis. *Fructus* non visi.

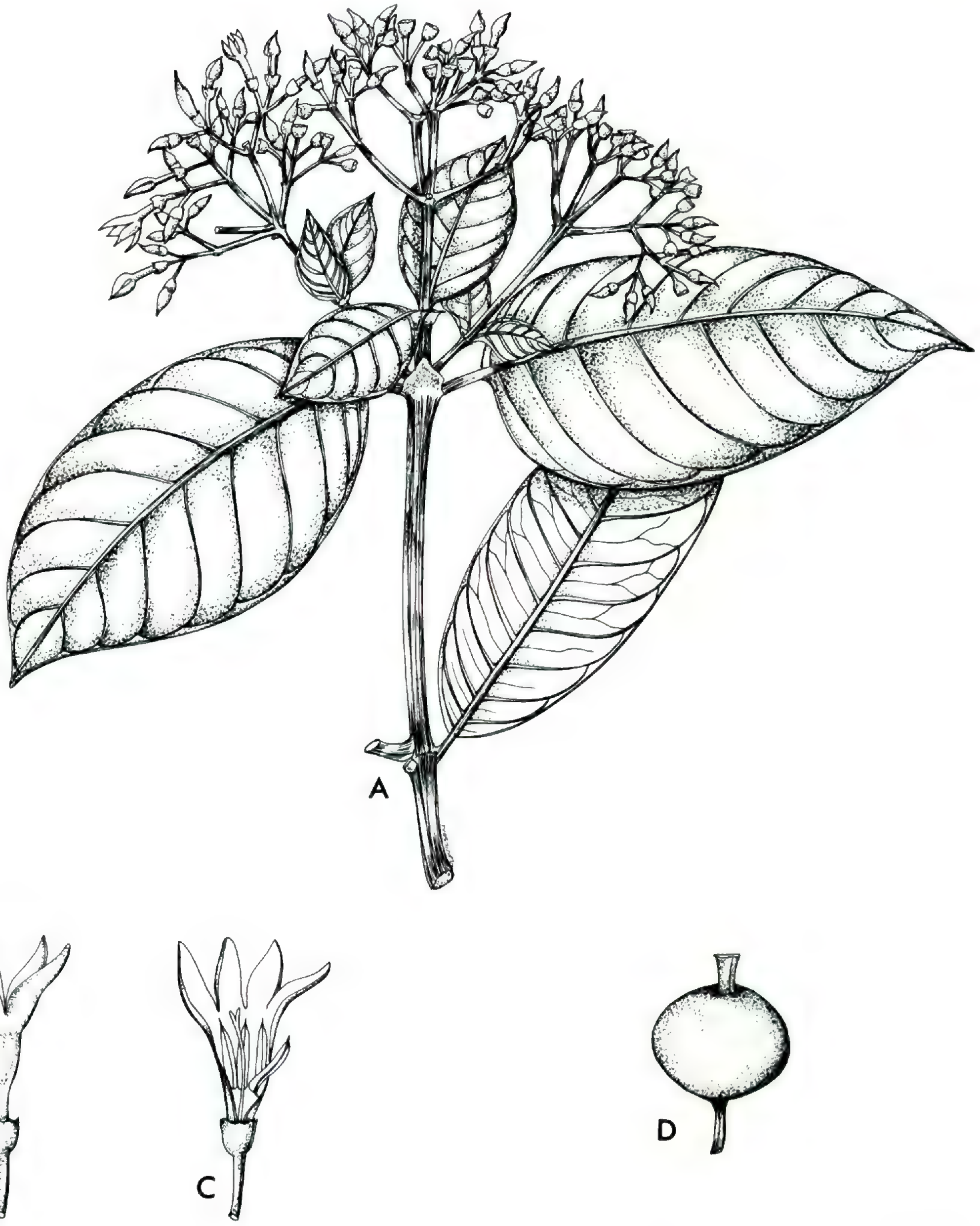

FIGURE 39. *Faramea papulata* Dwyer & Hayden.—A. Habit (×½).—B. Flower (×1.5).—C. Flower opened to show interior (×1.5).—D. Fruit (×2). [After *Mori 7998*.]

margin, prominulous beneath, the outer submarginal vein close to the margin, less prominulous and conspicuous than the inner submarginal vein, with 1–3 smaller veins paralleling the adjacent lateral veins, these soon branching, stiffly chartaceous, concolorous, the margin revolute; stipules persistent, free, rectangular or deltoid, to 0.5 cm long with a short median awn arising from a median keel, stiffly chartaceous, glabrous. *Inflorescences* terminal, the peduncle 3–4 cm long, ca. 0.15 cm wide, flowers ca. 15, aggregated into a head subtended by 2

ovate rotund bracts, to 1.5 cm long, the terminal awn about as long as the body. *Flowers* subsessile; hypanthium and calycine cup ca. 2 mm long, the teeth triangular, 0.2–0.4 mm long; corolla bluish white, the tube narrowly cylindrical, 1–1.2 cm long, ca. 0.1 cm wide, the lobes 4, 0.3–0.5 mm long. *Fruit* not known.

Faramea scalaris is known only from high elevations in the Province of Chiriquí. It may be conspecific with the well-collected *F. suerrensis* (Donnell Smith) Donnell Smith. Unfortunately the fruit of *F. scalaris* is not known.

CHIRIQUÍ: Bajo Chorro, near Boquete, 6000 ft, *Davidson 94* (US), *430* (MO), *436* (US). Between Alto de las Palmas and Cerro Horqueta, *Pittier 3265* (F, NY, US).

14. **Faramea suerrensis** (Donnell Smith) Donnell Smith, Bot. Gaz. 44: 112. 1907.

F. trinervia K. Schum. & Donnell Smith var. *suerrensis* Donnell Smith, Bot. Gaz. 31: 115. 1905. TYPE: Costa Rica, *Donnell Smith 6589*, not seen.

Trees to 15 ft tall, the branches stout terete, ultimately angular, glabrous, the nodes well spaced. *Leaves* oblong, ovate oblong or elliptic, to 14(30–) cm long, to 7(10.5–) cm wide, usually 2½ times longer than wide, acute to obtuse at the apex, cuspidate, the cusp often falcate, acute, obtuse or truncate, to 2 cm long, occasionally vaguely auriculate at the base, the costa prominulous above, prominent beneath, the lateral veins 13–15, usually with a smaller vein intermediate between 2 laterals paralleling these, at first strict, then arcuate and joining a prominent marginal vein, 0.5–0.7(1.0–) cm within the margin, usually with a second less prominent vein ca. 2 mm from margin the intervenal areas spreading reticulate, occasionally bullate, chartaceous to subcoriaceous, concolorous, glabrous; petioles absent or to 2 cm long, glabrous; stipules connate, cylindrical, oblong rotund, oblong rectangular to hemispherical, 6–7 mm long, 5–7 mm wide, minutely mucronate or retuse, glabrous. *Inflorescences* terminal, cymose corymbose, glabrous, to 9 cm long, sometimes epedunculate with 2 branches arising from the tip of the twiglet, sometimes long pedunculate, the peduncle to 5 cm long and the secondary branches ascending and flabellate or penicillate. *Flowers* with the pedicels slender, to 2.5 mm long; hypanthium oblong rotund, ca. 1.2 mm long, glabrous, the calycine cup rimlike ca. 0.3 mm long, glabrous but with a few glandular spots within, the teeth minute, to 0.3 mm long; corolla white (in bud), blue or purple, the tube narrow, to 6 mm long, ca. 1.2 mm wide, petaloid, glabrous; stamens 4, the anthers oblong, ca. 2.2 mm long, ca. 0.4 mm wide, minutely apiculate, the filaments attached near the middle of the tube; ovarian disc oblong rotund, ca. 1 mm long, the style short, the ovules ca. 0.3 mm in diam. *Fruits* reniform or compressed oblong, to 0.7 cm long, to 1.5 cm wide, about twice as wide as long, apiculate, smooth, often delicately ribbed, farinose or minutely rugulose.

Faramea suerrensis is known from Costa Rica, Panama, and Colombia (Choco). The fruit of *Duke & Lallathin 14977* (MO) is reported as blue.

BOCAS DEL TORO: Punta Peña, vicinity of Chiriquicito, *Lewis et al. 2145* (MO). Chiriquí Lagoon, *Wedel 1430* (F). Water Valley, *Wedel 1511* (MO, US), *1610* (MO). CHIRIQUÍ: Branch in road to Cerro Colorado and Escopeta above Río San Félix near town of San Félix, ca. 13 mi N of Río San Félix, 800–1200 m, *Croat 33428* (MO). COCLÉ: Cerro Pilón, *Duke & Lallathin 14977* (MO). El Cope, El

Potroso, Atlantic slope of Alto Calvario, *Folsom & Lantz 1887* (MO). Cerro Pilón, *Lallathin 5093* (MO). COLÓN: Camp Bejita, District Donoso, *Holdridge 6251* (MO). Santa Rita Ridge, *Mori & Kallunki 4919* (MO); *Mori & Crosby 6425* (MO). VERAGUAS: 6.4 km outside Santa Fé, road to Agricultural School, *Folsom 2965* (MO). Cerro Tute, *Folsom & Edwards 3336* (MO). COLOMBIA: CHOCO: Alto de Buey, 500–1200 m, *Gentry & Forero 7287* (MO).

15. **Faramea talamancarum** Standley, Field Mus. Nat. Hist., Bot. Ser. 4: 332. 1929. TYPE: Costa Rica. *Carleton 135* (F, holotype, US).

Trees to 15 ft tall, the branches slender, terete, smooth, glabrous, the nodes well spaced. *Leaves* oblong to obovate oblong, to 17 cm long, to 6 cm wide, cuspidate, the cusp to 1.5 cm long, erect or falcate, to 0.25 cm wide, obtuse, cuneate or acute at the base, scarcely inequilateral, the costa slender, prominulous above and beneath, the secondary veins 10–15, almost perpendicular, the submarginal vein not elevated or impressed, membranous to chartaceous, concolorous; petioles to 1 cm long, glabrous; stipules persistent, connate, the sheath cylindrical, 2–5 mm long, the awn 4–5 mm long. *Inflorescences* terminal, solitary, paniculate, cymose corymbose, 8–10 cm long, glabrous, sometimes the peduncle absent and usually 3 branches arising from the stem tip, sometimes 2–3 cm long, ca. 0.15 cm wide, the branches spreading or strongly ascending, in 2 or more pairs, opposite, 2–4 cm long. *Flowers* with the pedicels slender, 8–10 mm long; hypanthium compressed rotund, to 0.7 mm long, carnose, glabrous, the calycine cup inflated, glabrous, ca. 0.6 mm long, with several rubescent glandular spots within, the teeth 4, deltoid, to 0.3 mm long, acute; corolla blue, the tube narrow cylindrical, expanding apically, 10–17 mm long, the lobes oblong, to 6.5 mm long; stamens 4, the anthers narrowly oblong, 2.8–4 mm long, 0.6–0.8 mm wide, obtuse, cordate at the base, the filaments dorsifixed, to 1 mm long, attached above the middle of the tube; ovarian disc coroniform, to 0.35 mm long, the stigmas 2, upright, scarcely thicker than the style, 1–1.5 mm long, the style 1.8–3 mm long, ca. 0.2 mm wide, the ovules about as long as broad. *Fruits* not seen.

Faramea talamancarum is known from Costa Rica and Panama.

BOCAS DEL TORO: Río Teribe, between Quebrada Huron & Quebrada Schlunyik, *Kirkbride & Duke 496* (MO). Duwebdulup Peak, N Río Teribe, *Kirkbride & Duke 584* (MO). Fish Creek Mts, *Wedel 2191* (F, MO), *2243* (MO, US). COLÓN: Santa Rita Ridge, *Dwyer 8555* (MO). DARIÉN: Airstrip, Caná gold mine, 480 m, *Croat 37968* (MO). Paya, *Stern et al. 230* (MO, US). Caná, *Stern et al. 656* (MO).

16. **Faramea terreyeae** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 189. 1940. TYPE: Panamá, *Terry & Terry 1479* (F, holotype, isotype MO).

Shrubs to 8 ft tall, the branchlets terete, smooth, glabrous, the nodes well spaced. *Leaves* lanceolate or elliptic to 13 cm long, to 3.6 cm wide, at least 3 times longer than wide, often falcate, acute at the apex, cuspidate or caudate acuminate for ca. 1.5 cm, ca. 1.5 mm wide in the middle, prominulous above, subplane and grooved beneath, the lateral veins ca. 20, strict, joining a delicate and vaguely undulate vein ca. 0.2 cm from the margin, but without a distinctly elevated submarginal vein, papyraceous, discolorous; petioles to 0.5 cm long, slender, ca. 0.8 mm wide, glabrous; stipules connate, cylindrical, to 3 cm long, ca. 0.5 cm wide, the awn ca. 1 cm long. *Inflorescences* terminal, to 2.5 cm long,

the peduncle ca. 1 cm long, the lowermost bracts folded, ovate rotund or compressed rotund, to 2 cm long, with a slender awn arising from a slender keel-like thickening, papyraceous, glabrous. *Flowers* not clearly seen (cf. text below). *Fruits* not known.

Faramea terreyeae is known only from the type collection. It is closely related to *F. jefensis* Dwyer which has a very reduced inflorescence subtended by 2 large leaf-like bracts. *F. terreyeae* has papyraceous leaves whereas those of *F. jefensis* are thin coriaceous; the hypanthium and the calyx of *F. terreyeae* are about 2 mm long, while those of *F. jefensis* are about 6 mm long. Unfortunately the flowers of *F. terreyeae* are poorly known. Standley described the inflorescence as umbellate and capituliform; he noted that in addition to the 2 outermost large bracts there are 2 much shorter inner bracts. His description of the floral parts is meagre (translated from Latin): "Flowers short-pedicellate; hypanthium widely obovoid, 1.5 mm long, the calyx ring shaped, ca. 0.6 mm long, truncate, remotely and minutely denticulate."

DARIÉN: Caná-Cuasí Trail, Chepigana, 3000 ft, *Terry & Terry 1479* (F, MO).

17. **Faramea woodsonii** Standley, Ann. Missouri Bot. Gard. 28: 470. 1921. TYPE: Panamá, *Woodson & Schery 164* (MO, holotype).

Shrubs, the branchlets slender, terete, smooth, glabrous, the nodes well spaced. *Leaves* oblong, 3–7 cm long, 1–2.6 cm wide, tapering obtusely or occasionally acutely toward the apex, acuminate, the acumen 0.4–1 cm long, obtuse, cuneate to occasionally obtuse at the base, the costa slender, prominulous above and beneath, the lateral veins ca. 9, at first strict, then arcuate, forming an undulate vein 1–1.5 mm from the margin, 1–2 smaller, irregular, and soon branching veins arising between the lateral veins, the other conspicuous submarginal vein delicate, ca. 0.35 mm from the margin, the margin delicately revolute, the intervenal areas spreading reticulate, stiffly chartaceous, concolorous, drying gray or green, glabrous; petioles to 0.4 cm long; stipules connate, the sheath not deeply incised laterally, ovate rotund, to 4 mm long, glabrous, the median awn of each part almost as long as the sheath, extending along the body as a median keel. *Inflorescences* terminal, the flowers ca. 4, spread radially, the peduncle obsolete. *Flowers* to 2 cm long; hypanthium oblong, ca. 1 mm long, glabrous, the calycine cup ca. 0.5 mm long, with minute glands within, the teeth minute, disposed as 5 points; corolla blue, the tube narrow cylindrical, to 11.5 mm long, ca. 1.3 mm wide below, ca. 3 mm wide near the mouth, petaloid, glabrous, the lobes 4, ovate oblong, to 7 mm long; stamens 4, the anthers subsessile, oblong, 3–4 mm long, attached at the middle of the tube; style subulate, 1.5–3 mm long, the stigmas 2, minute, ca. 0.5 mm long, the hypanthium angular in cross section. *Fruits* on slender pedicels longer than the pericarp, the latter compressed rotund, to 0.8 cm long, smooth, glabrous, the persistent calyx ca. 0.5 mm long.

Faramea woodsonii is known only from Panama.

COCLÉ: El Valle, *Allen 3544* (MO); *Duke 12152* (MO); *Duke & Dwyer 13914* (MO); *Dwyer 11868* (MO); *Woodson & Schery 164* (MO). PANAMÁ: El Llano-Cartí Road, 16–18½ km N of Panamerican Highway, 400–450, *Nee & Tyson 10940* (MO).

FIGURE 40. *Ferdinandusa panamensis* Standley & Williams. Habit (×½). [After *Wedel 2250.*]

38. FERDINANDUSA

Ferdinandusa Pohl, Pl. Bras. Icon. Decr. 2: 8. 1828–1829. Substitute name for *Ferdinandea* Pohl, 1827. TYPE: *F. speciosa* Pohl.

Ferdinandea Pohl, Flora 10: 153. 1827, not *Ferdinanda* Lagasca, 1816. TYPE: No type indicated.
Aspidanthera Benth. in Hook., J. Bot. 3: 217. 1841. TYPE: *A. rudgeoides* Benth.
Gomphosia Wedd., Ann. Sci. Nat. Bot. 3: 10: 14. 1848. TYPE: No type indicated.

Trees or shrubs. *Leaves* with stipules interpetiolar. *Inflorescences* terminal, cymose paniculate or corymbose paniculate. *Flowers* 4–5-merous, the calycine cup cupuliform, the teeth reduced; corolla variable in color, infundibuliform or hypocrateriform, the lobes contorted in the bud, obliquely 2-lobed, emarginate; stamens ca. 4, the anthers exserted or included, often variable in size, the filaments often variable in length; ovary 2-celled, the ovules several to numerous in

each locule. *Fruits* capsular, cylindrical to rotund, loculicidally dehiscent, the seeds few to numerous, peltately affixed to an axile placenta, winged, the wing occasionally laciniate.

Ferdinandusa, a genus of about 20 species, is found in Panama and in South America.

1. **Ferdinandusa panamensis** Standley & Williams, Ceiba 3: 34. 1952. TYPE: Panamá, *Wedel 2232* (F, holotype; isotype, MO).—FIG. 40.

Trees to 60 ft tall, the branchlets terete, smooth, villose, minutely resinous pustulate (bases of deciduous hairs), the nodes well spaced. *Leaves* oblong, occasionally falcate, 10–17 cm long, 6.0–9.5 cm wide, obtuse and short acuminate, the acumen to 1 cm long, obtuse, occasionally truncate, the costa slender, prominulous above, prominent beneath, the lateral veins 12–15, prominulous, arcuate, stiffly papyraceous, glabrous above and beneath, the intervenal areas reticulate; petioles to 1 cm long, stout, villose, the lamina decurrent on the upper side; stipules deciduous, deltoid lanceolate, ca. 1 cm long, acuminate, glabrous. *Inflorescences* terminal, longer than the uppermost leaves, the peduncle shorter than the uppermost leaves, glabrous with 2 branches arising at the tip, the flowers several, ascending. *Flowers* with the hypanthium short, subrotund, ca. 2.5 mm in diam., glabrous, the calycine teeth reduced to 4–5 fleshy points; corolla white, the tube cylindrical, expanded at the apex and at the base, 1.5–2.3 cm long, 0.14 cm wide in the middle, fleshy to subcoriaceous, glabrous, the lobes 5, imbricate, oblong, ca. 0.8 mm long, not cucculate; stamens 5, the anthers dimorphic, usually 2 long and 2 short, dorsifixed, the thecae of some anthers dimorphic, oblong to rotund, the filaments linear, to 7 times the length of the anthers, attached below the middle of the tube; ovarian disc prominent, the style subulate to 11 mm long, the stigmas 2, ca. 1.5 mm long, wider than the style, oblong rotund. *Fruits* not seen.

Ferdinandusa panamensis is known only from Panama.

BOCAS DEL TORO: Fish Creek, Chiriquí Lagoon, *Wedel 2232* (F, MO), *2250* (MO).

39. GALIUM

Galium L., Sp. Pl. 105. 1753. Gen. Pl., ed. 5. 46. 1754. TYPE: *Galium mollugo* L.

Erect or decumbent *herbs* or *vines*, the stems often 4-angled, slender. *Leaves* 3–4 or more at a node, verticillate; stipules foliaceous. *Inflorescences* terminal or axillary, in dichasial panicles, the flowers not subtended by an involucre. *Flowers* bisexual, unisexual or polygamous dioecious, pedicellate; hypanthium articulate with the pedicel; calycine cup ovoid or globose, the lobes reduced or absent; corolla white, yellow or green, the lobes 3–4, valvate in the bud; stamens 2–4, exserted, the styles 2, the stigmas capitate; ovary 2-celled, the ovules solitary. *Fruits* didymous, fleshy or dry, separating finally into closed segments or only one carpel maturing; seeds concave.

Galium is a genus of about 400 species. It is well distributed throughout the world, especially in the temperate climates.

Literature:

Dempster, L. T. 1973. The Polygamous Species of the Genus *Galium* (Rubiaceae) Section Lophogalium of Mexico and Southwestern United States. U. Calif. Publ. Bot. 64: 1–36.

———. 1978. The genus *Galium* (Rubiaceae) in Mexico and Central America. U. Calif. Publ. Bot. 73: 1–33.

Greenman, J. M. 1898. Revision of the Mexican and Central American Species of *Galium* and *Relbunium*. Contr. Gray Herb. n.s. 14: 455–457.

a. Leaves 6–8(–10) at a node ..... 2. *G. mexicanum*
aa. Leaves 4 at a node.
  b. Leaves with lateral veins evident; fruit with white, uncinate hairs .... 3. *G. uncinulatum*
  bb. Leaves with lateral veins not evident; fruit glabrous ..... 1. *G. aschenbornii*

1. **Galium aschenbornii** Schauer, Linnaea 20: 701. 1847. TYPE: México, *Aschenborne 92* (JE, not seen).

Rubia acuminata Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11: 127. 1844. TYPE: México, *Galeotti 2362* (K, holotype).
Galium gemmiflorum Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11: 126. 1844. TYPE: México, *Galeotti 2604* (BR, holotype; isotype, K, not seen).
G. galeottianum Walp., Repert. Bot. Syst. 6: 17. 1846. TYPE: not seen.
G. uropetalum Hemsl., Biol. Centr. Amer., Bot. 2: 66. 1881. TYPE: not seen.

Vines, the stems angular, obtusely winged, glandular shiny, glabrescent, often with a few regularly arranged, retrorse, stumpy hairs. *Leaves* sessile, 4 per node, ovate oblong, to 5 mm long, acute, the lateral veins not evident or scarcely visible, subcoriaceous, glandular shiny above and presumably beneath, with several golden brown glands beneath. *Inflorescences* terminal, 1–2-flowered, to 1 cm long. *Flowers* not seen. *Fruits* subrotund, to 4 mm in diam., glabrous, drying black, obviously pedicellate.

Galium aschenbornii occurs in Mexico and Central America. Dempster provides an excellent description of the flowers and fruits (1978) based on a study throughout the range of the species: "flowers few, or sometimes many, 1 to several in imperfect, perfect, or compound dichasia borne on short leafy determinate branches; flowers staminate, pistillate, or perfect, on the same plant, or sometimes on different plants; corollas rotate, glabrous, usually red or pink, but sometimes yellow, white, or greenish, the lobes much prolonged at the apex; fruits glabrous, fleshy, black and wrinkled when mature, 3–7 mm across when dry."

CHIRIQUÍ: Volcán de Chiriquí, ca. 7000 ft, *Davidson 882* (MO, left-hand side of sheet). Chiriquí Volcano, *Killip 3582* (US).

2. **Galium mexicanum** H.B.K., Nov. Gen. Sp. Pl. 3: 337. 1818. NEOTYPE (Dempster, 1978): México, *Solbrig & Ornduff 4540* (UC). Original Humboldt & Bonpland type apparently lost.—FIG. 41.

G. mexicanum var. *glabratum* Greenm., Contr. Gray Herb., 14: 458. 1898. TYPE: México, *Nelson 583* (US).
G. mexicanum var. *platyphyllum* Greenm., Contr. Gray Herb. 14: 458. 1898. TYPE: México. *Nelson 3165* (US).

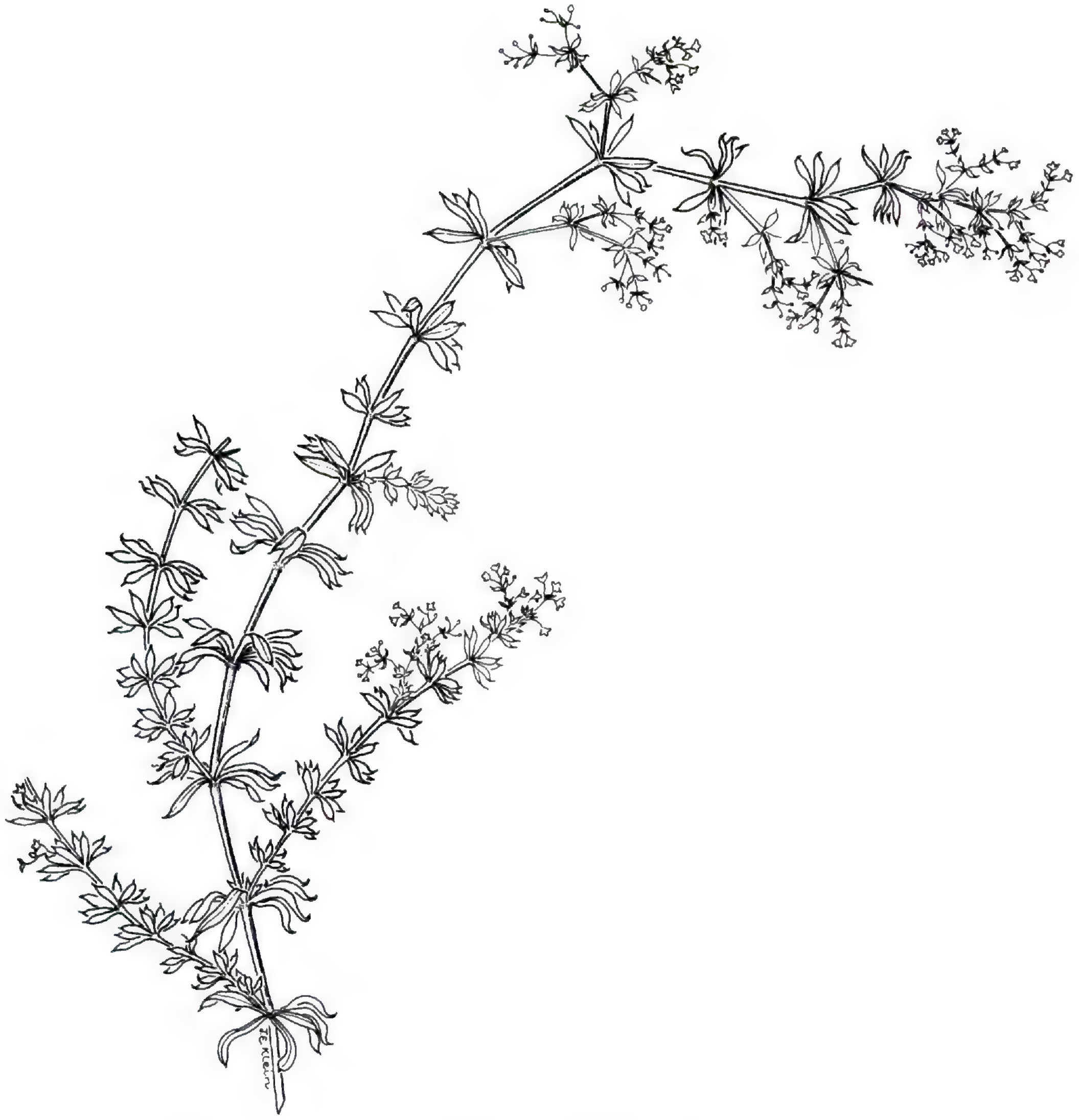

FIGURE 41. *Galium mexicanum* H.B.K. Habit (×⅔). [After *White 206.*]

Vines, the stems weak, stramineous, angular, branching profusely, the hairs stiff, minute, reflexed, uncinate, occasionally weak and spreading, the nodes well spaced. *Leaves* sessile or subsessile, usually 6–8(–10) at a node, occasionally 4, linear oblong or narrowly obovate oblong, 0.4–2.0 cm long, 1.3–2.0 mm wide, rounded or acute at the apex, tapering narrowly at the base, the costa prominulous above and beneath, the hairs well spaced, uncinate, rigid, the margin often revolute and with stiff, uncinate hairs, the blade glandular shiny, pubescent beneath, the hairs with bulbous bases, often deciduous, the blade then granulose. *Inflorescences* cymose paniculate, to 2 cm long (? longer). *Flowers* minute, 0.6–1.5 mm long; hypanthium subrotund, ca. 0.35 in diam., pubescent; calycine cup and lobes absent; corolla white, greenish white, occasionally purple or red, the tube scarcely measurable or to 0.2 mm long, the lobes 4, (2) ovate oblong, 0.5–

0.7 mm long, the tip acuminate, often deflexed adaxially, the acumen to ⅓ the length of the body of the lobe, petaloid, dorsally pubescent; stamens 4, the anthers oblong, ca. 0.2 mm long, the filaments 0.2–0.5 mm long, attached at the junction of the corolla lobes; style short, the stigmas terminal, capitate. *Fruits* compressed rotund, less than 1 mm long, wider than long at maturity, the hairs dense, thick, falcate, ca. 0.1 mm long.

Galium mexicanum ranges from Mexico to Panama.

CHIRIQUÍ: Volcán Barú, E slope, 1 mi from summit, ca. 3000 m, *Croat 34905* (MO). El Barú, above Boquete, 1200–1800 m, *D'Arcy 9919* (MO). Near Boquete, *D'Arcy & D'Arcy 6463* (MO). E slope of Volcán de Chiriquí, WNW of Boquete, *Davidse & D'Arcy 10187* (MO). 11 km WNW of Boquete, *Davidse & D'Arcy 10224* (MO). Bajo Mono, Boquete, *Davidson 595* (MO). Volcán de Chiriquí, 8000 ft, *Davidson 935* (MO). W side of Volcán Barú, oak forest, 2000–2500 m, *Mori & Bolten 7355* (MO). Valley of upper Río Chiriquí Viejo, Monte Lirio, 1300–1900 m, *Seibert 276* (MO). 3 mi N el El Volcán, ca. 5000 ft, *Tyson 5721* (MO). Volcán de Chiriquí, *White 206* (MO, US). Finca Lerida to Peña Blanca, 1750–2000 m, *Woodson & Schery 334* (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 443* (MO).

3. **Galium uncinulatum** DC., Prodr. 4: 600. 1830. TYPE: not seen.

G. obstipum Schlecht., Linnaea 9: 592. 1834. TYPE: Mexico, *Schiede 248* (HAL, not seen, isotypes MO, NY; P, W, neither seen).
G. nelsonii Greenm., Proc. Amer. Acad. Arts 33: 460. 1898. TYPE: México, *Nelson 628* (US).

Herbs, the stems slender, weak, 4-angled, much branched, hispid, *Leaves* 4-nate, subsessile, elliptic oblong, or ovate oblong, 1.5–2.3 cm long, 0.5–1.3 cm wide, rounded, obtuse or deltoid at the apex, cuneate or rounded at the base, the apiculum minute but obvious, the lateral veins 2, basal and arcuately ascending, usually with 2 other more delicate veins arising along the costa, membranous, hispid on both sides; stipules not seen. *Inflorescences* terminal or axillary, dichotomously corymbose, to 7 cm long; peduncle to 4 cm long, with 2 or more frequently foliose bracts to ½ the length of the regular leaves, subtending a pair of branches, the flowers few. *Flowers* pedicellate, the pedicels 0.1–1.0 cm long; hypanthium rotund, ca. 0.7 mm in diam., the hairs abundant, strict, white, stiff, terminally uncinate, to 0.7 mm long, the calycine cup and teeth not visible; corolla greenish yellow or yellow, the tube short, the lobes 4, ovate or oblong, ca. 1 mm long, acute, pubescent inside and out. *Fruits* rotund or compressed rotund, didymous, the body 1–2 mm wide, the hairs dense, often obscuring the body, radiate, tawny, usually hooked at the apex.

Galium uncinulatum ranges from Arizona, Texas, and Mexico to Central America.

CHIRIQUÍ: E of Boquete, road to Cerro Azul, 1300–1500 m, *Croat 26754* (MO). E slope of Volcán de Chiriquí, 2200–2300 m *Davidse & D'Arcy 10178* (MO). Bajo Mono, Boquete, 4500 ft, *Davidson 585* (MO). Volcán de Chiriquí, Boquete, 7000 ft, *Davidson 882* (MO). Valley of Río Chiriquí Viejo, 1300–1900 m, *Seibert 205* (MO). Río Chiriquí Viejo Valley, near El Volcán, *White 184* (MO). Finca Lerida, 1750 m, *Woodson & Schery 219* (MO).

40. GENIPA

Genipa L., Gen. Pl. ed. 5. 87. 1754. LECTOTYPE: *G. americana* L.

Trees. *Leaves* opposite, coriaceous, petiolate; stipules interpetiolar, often persistent, triangular, connate basally. *Inflorescence* of a single axillary or terminal

cyme, the flowers several, occasionally solitary. *Flowers* large, bisexual, 5–6-merous; calyx campanulate or turbinate, truncate, the teeth absent or of 5–6 short lobes; corolla short cylindrical, the lobes 5–6, contorted in bud, often longer than the tube; stamens 5–6, the anthers usually sessile, inserted at the mouth, dorsifixed, exserted; ovary 2-celled, the ovules numerous, usually disposed horizontally. *Fruits* baccate, usually globose, smooth, leathery, the wall thick, the seeds numerous, large, usually trapeziform, disposed in several rows in a fleshy pulp.

Genipa is a genus of about 7 species, occurring in tropical Florida, Mexico, Central America and in South America.

a. Leaves drying black; corolla pubescent outside ..... 1. *G. americana*
aa. Leaves drying brown; corolla glabrous outside.
  b. Leaves lanceolate, 3.7–5.2 cm wide, deltoid at the apex; corolla lobes ca. 4.5 mm wide; fruits ca. 3 cm in diam. ..... 2. *G. curviflora*
  bb. Leaves obovate rotund, obovate or oblong, 3.5–10.0 cm wide, rounded or obtuse at the apex; corolla lobes ca. 1 cm wide; fruits 3.5–5.0(–7.0) cm in diam. ..... 3. *G. williamsii*

1. **Genipa americana** L., Syst. Nat., ed. 10. 2: 931. 1759. TYPE: not seen—FIG. 42.

Gardenia genipa Swartz, Prodr. Veg. Ind. Occ. 51. 1788. TYPE: not seen.
Genipa oblongifolia Ruiz & Pavón, Fl. Peruv. Chil. 2: 67. 1798. TYPE: not seen.
G. grandifolia Pers., Syn. Pl. 1: 198. 1805. TYPE: not seen.
G. caruto H.B.K., Nov. Gen. Sp. Pl. 3: 407. 1820. TYPE: Venezuela and Colombia, *Humboldt & Bonpland* (P, not seen).
G. humilis Vell., Fl. Flum. 94. Ic. 2: *pl. 142*. 1825. TYPE: not seen.
G. pubescens DC., Prodr. 4: 379. 1830. TYPE: Cuba, *de la Osa* not seen.
G. barbata Presl., Symb. Bot. Upsal. 2: 13. 1832. TYPE: Brazil, *Blanchet*, not seen.
Genipa americana var. *caruto* (H.B.K.) Schum. in Mart., Fl. Bras. 6(6): 352. 1889.
G. excelsa Krause, Bot. Jahrb. Syst. 40: 327. 1908. TYPE: not seen.
G. americana var. *caruto* fo. *grandifolia* Chod. & Hassl., Bull. Herb. Boissier ser. 2, 4: 171. 1904. TYPE: Paraguay, *Hassler 7851* (G, isotype).
G. excelsa Krause, Bot. Jahrb. Syst. 40: 327. 1908. TYPE: not seen.

Trees 20 m tall, the twigs terete, ultimately angular, the bark smooth, glabrous, the nodes well spaced or crowded terminally. *Leaves* usually strongly ascending, elliptic, elliptic oblong or obovate oblong, 11–28 cm long, 6–13 cm wide, deltoid or somewhat rounded toward the apex, acuminate, the acumen short, attenuate toward the base, the costa prominulous above, prominent beneath, the lateral veins 11–20, arcuate ascending, thin coriaceous to coriaceous, shiny and glabrous above, often drying black, glabrous to velutinous pubescent beneath, the hairs dense but short; petioles stout, to 1 cm long; stipules free, ovate, to 1.5 cm long, acute, coriaceous to thickly scarious, glabrous to puberulent toward the scarious margins, the margins thickened, pubescent, drawn into a subulate process. *Inflorescences* terminal, cymose, 4–10 cm long or much longer; peduncle short, the bracts ovate, 3–4 mm long, acuminate, the branches to 9, few or many flowered. *Flowers* to 3.5 cm long, bisexual on pedicels to 1.2 cm long; hypanthium narrowly oblong; calycine cup turgid, ca. 0.6 cm long, stiffly carnose, the margin truncate, the teeth as mere points, glabrous except often with a few hairs marginally;

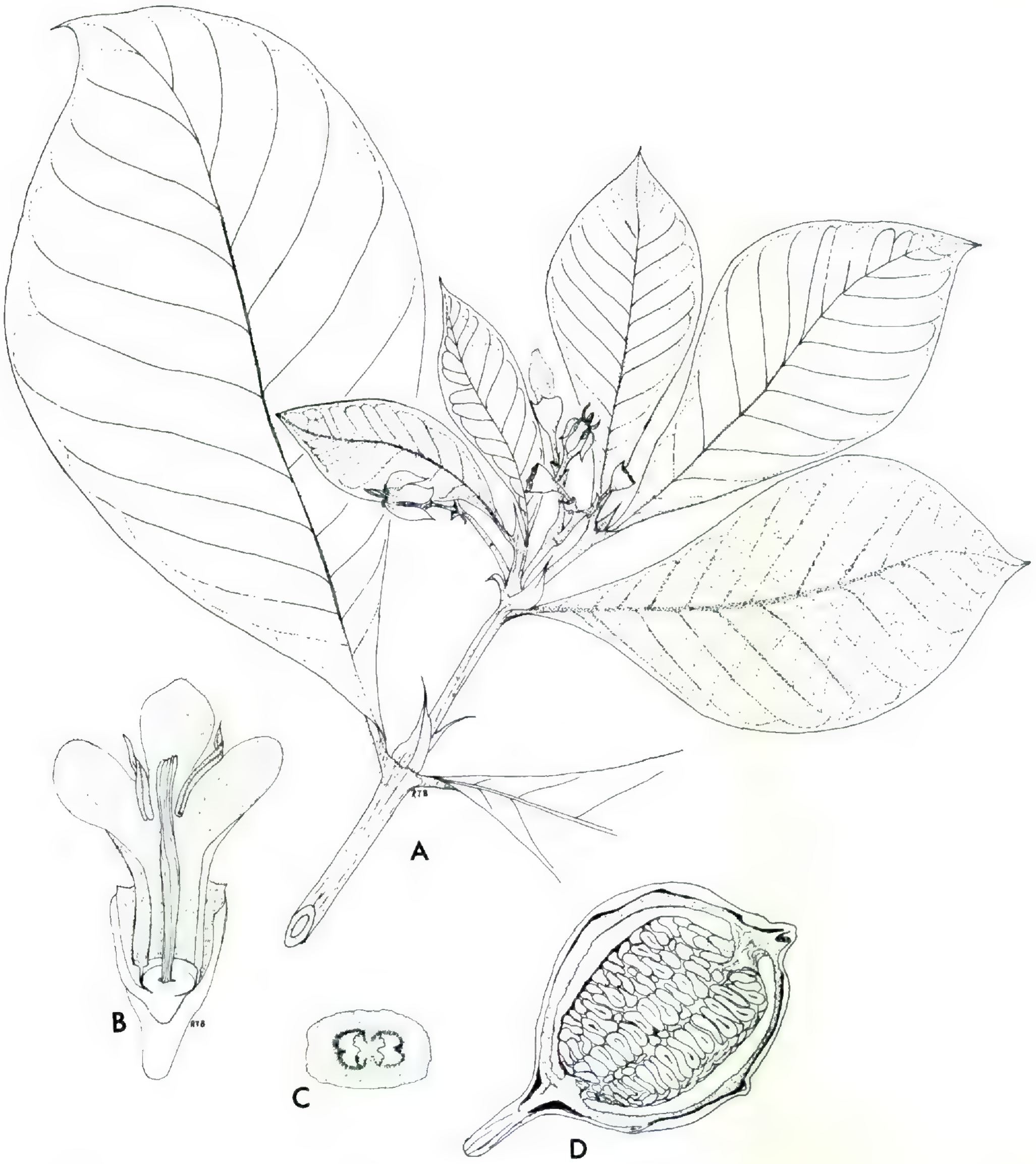

FIGURE 42. *Genipa americana* L.—A. Flowering branch (×.45). [After *Blum & Dwyer 2477.*]—B. Flower (×2.7).—C. Ovary in cross section (×2.7). [After *Bartlett & Lasser 16465.*]—D. Fruit (×.45). [After *Croat 7913.*]

corolla cream white, the tube short cylindrical, ca. 1.5 cm long, 0.8–1.0 cm wide, densely velutinous hairy or villose outside and in, the hairs to 2 mm long, the lobes 5–6, oblong, 1.5–2.5(–3.0) cm long, longer than the tube, widely deltoid at the apex, reflexed at anthesis; anthers 5, subsessile, narrow oblong, 8.0–9.5 mm long, the connective produced for ca. 1.5 mm at the apex, ultimately acute or obtuse, the filaments attached near the mouth; stigmatic lobes 2, narrowly lanceolate, erect, ca. 7 mm long, partially exserted. *Fruits* oblong or subrotund, to 9 cm in diam., glabrous, silvery gray outside, the persistent calyx short, giving a craterlike effect, ca. 1 cm in diam.

Genipa americana is found in tropical Florida, Mexico, Central America, West Indies, and tropical South America, extending to Paraguay.

Duke (1968) states that according to the Cuna: "Pulp of the fruits is edible raw; it is used to make sweet and fermented beverages; sometimes pickled with vinegar and onions. The flowers are attractive to bees and the fruits to cattle. Indians paint their bodies black with the pulp; some OICS personnel claimed it does improve the complexion and state that it is insecticidal. It is the 'Tree of Life' to the Cuna. 'Apples of Immortality' arise from the Earthmother's placenta and umbilical cord; the juice turns the skin black, thus hiding the individual from the devils that cause disease. It appears to be bacteriocidal, germicidal, and insect repellent. It is said to be the only medicine capable of flushing the parasitic catfish which attacks man south of the study areas. The Cuna have a special song of the jagua (*Genipa americana*) known as 'quanekigala.'" In Panama the most common name is "Jagua"; other common names are "Guaytil Blanco"; "Guaitil Blanco"; "Jagua Amarilla"; "Jagua Blanca"; "Jagua Colorado"; and "Jagua de Montana." It is used throughout its range for construction of buildings, furniture and carts.

Julian A. Steyermark (The Botany of the Guayana Highland, Mem. N.Y. Bot. Garden 23: 349. 1972) discusses in detail the typification of *Genipa americana*.

CANAL ZONE: Cerro Viejo, K 16 C, *Blum 1265* (MO). Fort Kobbe, *Duke 3943, 4189, 4259* (all MO). Farfan Beach, *Duke 11734* (MO). Río Mar, *Duke 12427* (MO). K-9 Road, *Ebinger 516* (MO). Mandingo River, *Hayden 57* (MO). Arraíjan, *Hayden 112* (MO). Albrook, U.S. Army Tropic Test site, *Hayden 134A* (MO). Survival School, Fort Clayton, *Kirkbride & Elias 268* (MO). Howard Air Force Base, SE of Kobbe Beach, *Oliver & MacBryde 1867* (GH, MO, US), *1899* (MO). Ancón Hill, *Seibert 409* (MO). Cerro Luisa, vicinity of Pedro Miguel Locks, *Stern & Chambers 8* (MO). Survival School, Fort Clayton, *Tyson 1051* (MO). BARRO COLORADO ISLAND, *Croat 7913* (MO). Cardenal Creek, Fort Clayton, *Tyson 1279* (MO). Miraflores, *White 126* (MO). BARRO COLORADO ISLAND: *Robyns 65-33* (MO); *Shattuck 415* (MO). CHIRIQUÍ: 12.4 mi N of David, *Lewis et al. 728* (GH, MO). COCLÉ: Río Hato Airstrip, *Blum & Dwyer 2477* (MO). Penonomé, *Dwyer 2002* (MO). DARIÉN: Río Ucurgantí, *Bristan 1185* (MO). Isla Casaya, *Duke 10390* (MO). HERRERA: Guararé, *Rodriguez 26* (MO). LOS SANTOS: 4 mi S of Limón, *Correra & Galegos 66* (MO). Punta Mala, *Croat 9755* (MO). Candelaria, *Duke 12453* (MO). Monagre Beach, *Tyson et al. 3021* (MO). PANAMÁ: Río Pacora, *Bartlett & Lasser 16465* (MO). Cerro Campana, *Castillo 2* (MO). Río Pita, *Duke 4763* (MO). Farfan Beach, *Duke 11734* (MO). Río Mar, *Duke 12427* (MO). La Bayoneta, Perlas Archipelago, *Dwyer 1733* (MO). Tocumen, *Dwyer 2894, 4347* (both MO). San José Island, *Johnston 1358* (MO). Palo Seco, *Mejia 20* (MO). Isla del Espiritu Santo, *Tyson 5558* (MO). Isla Taboga, *Woodson et al. 1480* (MO). VERAGUAS: Santiago, *Dwyer & Kirkbride 7427* (COL, DUKE, MO, UC), *7429* (GH, MO).

2. **Genipa curviflora** Dwyer.[49] TYPE: Panamá, *Nee & Warmbrodt 10347* (MO, holotype).

Shrubs or small *trees* to 4 m, the branchlets angular, smooth, minutely puberulent, the nodes turgid, often well spaced. *Leaves* lanceolate, 11.5–20.0 cm long, 3.7–6.8 cm wide, deltoid toward the apex, the acumen short, to 1 cm long, ultimately obtuse, cuneate toward the base, the costa prominulous and often

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[49] *Genipa curviflora* Dwyer, spec. nov. *Frutices* vel *arbores* ramulis puberulis. *Folia* lanceolata, 11.5–20.0 cm longa, 3.7–6.8 cm lata, venis lateralibus 7–12, tenui-coriacea supra glabra subtus puberula; petiolis ad 2.5 cm longis; stipulis ovato-trapeziformibus. *Inflorescentiae* terminales ad 4 cm longae, floribus ca. 7. *Flores* pedicellati cupula calycis ad 0.5 mm longa, coriacea glabra dentibus nullis; corolla tubo angusto-cylindrico, ca. 1.5 cm longo, falcato, glabro lobis 4 carnosis basi unilateraliter auriculatis; antheris sessilibus lineari-oblongis, ca. 8.5 mm longis. *Fructus* subsessiles rotundi, ca. 3 cm in diam., laeves glabri.

sulcate above, subprominent beneath, the lateral veins 7–12, at first stiff, then arcuate toward the margins, uniting to form an undulate submarginal vein ca. 5 mm distant from the margin, prominulous beneath, the intervenal areas spreading, conspicuously thin coriaceous, concolorous, glabrous above, minutely puberulent beneath; petioles to 2.5 cm long, ca. 0.2 cm wide, lignose; stipules free, often deciduous, ovate trapeziform, to 1.7 mm long, acute, at first scarious then somewhat ligneous, puberulent. *Inflorescences* terminal, to 4 cm long; peduncle absent or to 0.5 cm long, the flowers ca. 7, perhaps flabellately disposed. *Flowers* (in bud) on pedicels to 1 cm long, rigid, shiny, the calycine cup acetabuliform, ca. 0.5 mm long, coriaceous, glabrous, the margin undulate with lobes absent or 4, widely triangular, ca. 0.2 mm long; corolla white, the tube narrow cylindrical, ca. 1.5 cm long, falcate, glabrous, carnose, the lobes 4, the buds conspicuously obtuse at the apex, to 1 cm long, ca. 0.45 cm wide, carnose, concave, auriculate unilaterally basally; stamens 4, the anthers sessile, linear oblong, ca. 8.5 mm long, ca. 0.8 mm wide, obtuse toward the apex, attached above the middle of the tube; ovarian disc coroniform, ca. 1 mm long, black when dry; style slender, to 1.2 cm long, plane, the stigmas 2, narrowly triangular, ca. 1 mm long, acute, scarcely wider than the style, pubescent, the ovary sometimes lacking, the ovarian wall thin, the locule ample, the ovules numerous. *Fruits* subsessile, rotund, ca. 3 cm in diam., smooth, glabrous, purple black when dry, the calycine scar ringlike, ca. 0.6 cm in diam.

Genipa curviflora is known only from Panama. Few flowers were available for dissection and these are in the bud stage. On dissecting two buds of *Duke 10678* I found that the locule of the ovary is located at the proximal end of what appears to be the pedicel. Two buds of *Nee 10347* showed no ovary in the presumed pseudopedicel, although the style and stigmas were evident. Thus, it seems advisable to call the structure in the latter a true pedicel and its counterpart (*Duke 10678*) a pseudopedicel.

Genipa curviflora is closely related to *G. williamsii* Standley, known only from Panama, being distinguished by its narrower leaf blades which taper somewhat at the apex and which are only thin coriaceous. The fruits are smaller than those of *G. williamsii*.

DARIÉN: Camp Summit between Mortí and Sasardí, 1800 ft, *Duke 10678* (MO). PANAMÁ: El Llano to Cartí Road, ca. 14 km N of Panamerican Highway, 350–500 m, *Folsom & Kauke 1403* (MO); *Folsom et al. 1475* (MO). El Llano-Cartí Road, 8 km N of Panamerican Highway, 450 m, *Nee & Warmbrodt 10347* (MO).

3. **Genipa williamsii** Standley, J. Wash. Acad. Sci. 8: 642. 1918. TYPE: Panamá, *R. S. Williams* (US, holotype).

Trees 4–20 m tall, the twiglets stout, ultimately 4-angled, the bark rough, smooth, glabrous, the nodes moderately well spaced, the leaf scars triangular rotund, ca. 5 mm in diam. *Leaves* oblong rotund to obovate oblong, to 33 cm long, to 16 cm wide, rounded or obtuse at the apex, not acuminate, cuneate, rounded or obtuse at the base, the costa slender, prominulous above, prominent beneath proximally, the lateral veins 9–12, arcuate, with an undulate, submarginal vein well set in from the margin, coriaceous, scarcely discolorous, drying a deep brown, glabrous; petioles 0.5–6.0 cm long, stout, to 0.4 cm wide, rigid, lignose,

often curved basally; stipules deciduous, presumably rhomboid oblong, to 3.2 cm long, to 1.8 cm wide, striate, coriaceous, glabrous except ciliolate, thickened basally. *Inflorescences* terminal, the flowers 3–4(–7) on a suppressed peduncle, to 1 cm long, the bracteoles triangular, to 3 mm long. *Flowers* perhaps monoecious, subsessile or pedicellate, the pedicels to 1 cm long, ca. 0.2 cm wide, drying black, glabrous; buds ca. 5 cm long, clavate, the mass of corolla lobes oblong, to 2 cm long, ca. 1.3 cm wide; hypanthium often blending in with pedicel, turbinate, ca. 5 mm long, drying black, glabrous, the calycine cup scarcely measurable, platelike, with 5 vague lobes, compressed rotund, ca. 1 mm long, wider than long, glabrous, coriaceous; corolla white, the tube 1.8–3 cm long, ca. 0.5 cm wide in the middle in bud, to 1 cm wide in open flowers, coriaceous, glabrous outside, the lobes 5, imbricate, triangular oblong, to 2.1 cm long, to 1.5 cm wide, glabrous outside, often with a few scattered white hairs within; male flowers with anthers sessile, 1.8–2.0 cm long, ca. 1 mm wide, attached below the mouth; rudimentary style linear, ca. 2.5 cm long, ca. 1 mm wide; stigmas 4, unequal (at least one of 4), oblong, to 4 mm long, acute with a few hairs adaxially. *Fruits* rotund, to 7 cm in diam., smooth, glabrous, drying black, the wall to 1 cm thick, the seeds numerous, plano compressed, oblong or subrotund, to 1 cm long, yellow, embedded in a white pulp.

Genipa williamsii is known only from Panama and Colombia. This species is easily recognized by a combination of characters: leaves rounded and obtuse at the apex, drying brown; buds elongate and clavate at the apex; fruits very large and drying black. I have not seen female flowers. One of the striking floral characters is the fact that the flower buds are elongate and clavate while the open flowers appear much shorter than the buds. According to *Duke (8026)* the "fruit (is) very bitter."

PANAMA: COCLÉ: Furlong's Finca, Cerro Pilón, 880 m, *Croat 37571* (MO). 3 km NE of El Valle, *Mori & Kallunki 2959* (MO). La Mesa, 4 km N of El Valle, 875 m, *Nee & Dwyer 9152* (MO). DARIÉN: Caná, *Williams 814* (US). PANAMÁ: Cerro Jefe, *Duke 8026* (MO). Cerro Azul to Cerro Jefe, *Dwyer 5041A* (MO). 9.4 km N of Goofy Lake, 900 m, *Folsom et al. 1987* (MO). 4.8 km N of highway, W of El Llano, Cerro Jefe, *Gentry 5517, 6138* (both MO). El Llano-Cartí Road, 12.7 km from Panamerican Highway, *Mori et al. 4688* (MO). El Llano-Cartí Road, 8–11 km from Panamerican Highway, *Mori 7712, 7717* (both MO). E slope of Cerro Jefe, *Tyson 3397* (MO). Cerro Jefe, *Tyson et al. 4441* (MO). COLOMBIA: CHOCO: Municipio de Novita. Vereda Llanadas. Ladera norte del Cerro Torra. Filo al Oeste del Río Surama. Camino al Alto del Oso, 600–900 m, *Forero et al. 3082* (MO).

41. GEOPHILA

Geophila Don, Prodr. Fl. Nepal. 136. 1825. Nomen conserv. TYPE: *G. reniformis* D. Don, nom. illeg. = *G. herbacea* (Jacq.) Schumann.

Carinta E. F. Wight, Contr. U.S. Natl. Herb. 9: 216. 1905. TYPE: *Psychotria herbacea* Jacq. = *Geophila herbacea* (Jacq.) Schumann.

Geocardia Standley, Contr. U.S. Natl. Herb. 17: 444. 1914. TYPE: not indicated.

Creeping *herbs*. *Leaves* often cordate, membranous; petioles elongate. *Inflorescences* axillary, usually pedunculate, the flowers few in a terminal cluster. *Flowers* with the calycine tube dentate or lobate; corolla funnelform, pilose in the throat, the lobes valvate; stamens 4–7, the filaments slender, inserted in the throat; ovary 2-celled. *Fruits* fleshy, drupaceous, the 2 nutlets plano convex, compressed dorsally, usually costate.

Geophila, a genus of about 30 species, occurs throughout the tropical areas of the world.

Literature:

Steyermark, J. A. 1977. A new member of the Rubiaceae from Panama. Phytologia 35: 401–402.

a. Leaf blades with auricles not overlapping at the base; bracts lanceolate or lance oblong.
  b. Leaves with abundant cystoliths beneath, the blades 2.5–6.0 cm long, 2.0–4.5 cm wide; peduncles 0.1–0.2 cm long at anthesis, glabrous ..... 1. *G. croatii*
  bb. Leaves lacking cystoliths beneath, the blades 2–9 cm long, 1.0–8.5 cm wide; peduncles 0.8–5.0(–8.0) cm long at anthesis, puberulous ..... 2. *G. macropoda*
aa. Leaf blades with auricles overlapping at the base; bracts subulate ..... 3. *G. repens*

1. **Geophila croatii** Steyermark, Phytologia 35(6): 401–402. 1977. TYPE: Panamá, *Croat 6647* (MO, holotype).

Creeping *herbs*, glabrous, conspicuously rhizophorus at the nodes, the roots fibrous. *Leaves* widely ovate or lance oblong, 2.5–6.0 cm long, 1.5–4.5 cm wide, acute or acuminate at the apex, cordate at the base, the lateral nerves 4–5, prominulous beneath, uniting to form a vein 1–5 mm from the margin, membranous, glabrescent or the costa and the veins with a few hairs with abundant cystoliths beneath; petioles 0.5–9.0 cm long, glabrous to puberulent; stipules ovate, ca. 3 mm long, obtuse, glabrescent. *Inflorescences* capitate umbellate, the peduncle at anthesis 1–2 mm long, elongating in fruit, to 20 mm long, the flowers usually 5–7 in a head; bracts lance oblong or lanceolate, 3.0–4.5 mm long, 1.0–1.5 mm wide, glabrous; pedicels less than 1 mm long at anthesis, to 3 mm long in fruit, glabrous. *Flowers* with hypanthium and calyx 2.0–4.5 mm long, the calycine lobes 5, narrowly oblanceolate or lanceolate, 2.5–3.5 mm long, much longer in fruit, glabrous; corolla white, ca. 5 mm long, with hairs clustered below filament attachment, the lobes slender; stamens with filaments connate below. *Fruits* ovoid or globose, 3–4 mm in diam., red, often in a cluster of 3; seeds oblong, to 4 mm long, plane on one side, somewhat twisted, the ribs 3, faint.

Geophila croatii is known only from Panama.

CANAL ZONE: Barro Colorado Island, *Croat 6647, 10989* (both MO). Gaillard Highway between Summit Garden and Gamboa, *Sullivan 27* (MO).

2. **Geophila macropoda** (Ruiz & Pavón) DC., Prodr. 4: 537. 1830.

Psychotria macropoda Ruiz & Pavón, Fl. Peruv. Chil. 2: 63. 1799. TYPE: Peru, *Ruiz & Pavón*, not seen.
Coccocypselum macropodum (Ruiz & Pavón) Britton, Bull. Torrey Bot. Club 18: 107. 1891.
Cephaelis violaefolia H.B.K., Nov. Gen. Sp. Pl. 3: 379. 1818. TYPE: Colombia, between Barthomome and Nares, *Humboldt & Bonpland*, not seen.
Geophila violaefolia (H.B.K.) DC., Prodr. 4: 537. 1830.
Geophila herbacea violaefolia (H.B.K.) Chod. & Hassl., Bull. Herb. Boissier II. 4: 180. 1904.
Geocardia violaefolia (H.B.K.) Standley, Contr. U.S. Natl. Herb. 17: 445. 1914.

Creeping *herbs*, the stems weak, glabrous, often farinose. *Leaves* 1–4 at a node, cordate or ovate cordate, 2–9 cm long, 1.0–8.5 cm wide, occasionally wider than long, acute at the apex, cordate at the base, the auricles not overlapping, occasionally inequilateral, the costa plane above, prominulous beneath, the lateral

veins 4–6, the intervenal areas reticulate, papyraceous, glabrous above, glabrescent beneath, the cystoliths not evident; petioles weak, flexuous, 0.8–14.0 cm long, rubescent, pubescent; stipules not seen. *Inflorescences* with peduncles 0.3–3.5 cm long, much longer in fruit, puberulous, the flowers few, aggregated terminally in clusters to 0.8 cm wide; bracts lanceolate, to 3 mm long. *Flowers* with the hypanthium rectangular, ca. 1.5 mm long, 1 mm wide, the calycine cup ca. 1 mm long, stiffly petaloid, glabrous outside and inside, with a few glands proximally within, these separate or clustered in 2's or 3's, oblong, ca. 0.1 mm long, mostly obtuse, the teeth 5, linear lanceolate, slightly unequal, 2.2–3 mm long, to 0.5 mm wide; corolla white, not seen; stamens not seen; ovarian disc hemispherical, to 0.8 mm long, smooth and glandular shiny, the style slender, to 3 mm long, glabrous, the stigmas 2, digitiform, ca. 0.8 mm long. *Fruits* (usually 2 maturing), ovoid, to 1 cm long, glabrous, the calyx persistent, 1–2 mm long.

Geophila macropoda occurs in Costa Rica, Panama and Colombia. "Nomas Tuwat" (Cuna, fide *Duke 14317*).

BOCAS DEL TORO: Banana farm, Armuelles, *Dickson 2292* (MO). Vicinity of Nievecita, *Woodson et al. 1851* (F, MO). DARIÉN: Río Pirre, trail from El Real to Tucutí, *Duke 5201* (MO). PANAMÁ: Piria-Cañasas Trail near Piria, *Duke 14317* (MO). SAN BLAS: Headwaters, Río Mulatupo, *Elias 1739* (GH, MO). 3–4 hours up Río Mulatupo, *Kirkbride 217* (MO).

3. **Geophila repens** (L.) Johnston, Sargentia 8: 281. 1949.—FIG. 43.

Rondeletia repens L., Syst. Nat. ed. 10. 928. 1759. TYPE: Jamaica, not seen.
Psychotria repens (L.) L., Amoen. Acad. 5: 377. 1759.
P. herbacea Jacq., Enum. Pl. Carib. 16. 1760. TYPE: Martinique, not seen.
Cephaelis reniformis H.B.K., Nov. Gen. Sp. Pl. 3: 377. 1819. TYPE: not seen.
Geophila cordata Miq., Linnaea 17: 72. 1843. TYPE: Surinam, *Focke 471*.
Mapouria cordata (Miq.) Müll.-Arg., Mart. Fl. Bras. 6(5): 426. 1881.
M. herbacea (Jacq.) Müll.-Arg., Mart. Fl. Bras. 6(5): 427. 1881.
Geophila herbacea (Jacq.) Schum., Engl. & Prantl. Nat. Pflanzenfam. 4. 4: 119. 1891.
Geocardia herbacea (Jacq.) Standley, Contr. U.S. Natl. Herb. 17: 444. 1914.
Carinta repens (L.) Smith & Downs, Sellowia 7: 88. 1956.
C. repens (L.) Brem., Verh. Kon. Nederl. Akad. Wetens 54: 118. 1963. Redundant combination.
Carinta repens var. *americana* Brem., Verh. Kon. Nederl. Akad. Wetens, 119. 1963. TYPE: not seen.

Prostrate *herbs*, rooted at the nodes, the stems weak, the nodes well spaced. *Leaves* cordate, occasionally ovate rotund, (1.2–)1.7–4.5(–5.0) cm long, 1.3–4.2(–5.0) cm wide, obtuse, widely deltoid or rounded at the apex, basally cordate, auriculate, the auricles overlapping, the lateral veins 5, the 3 proximal veins arising from a common point, prominulous beneath, the veinlets inconspicuous, glabrous to scabridulous above, glabrous beneath except on the costa, usually with cystoliths on the lower surface; petioles 0.6–4.5(–6.0) cm long; stipules not seen. *Inflorescences* capitate with the peduncle 0.8–5.0(–8.0) cm long, glabrous to papillate at anthesis, the flowers few; bracts subulate, to 5 mm long, pilose, the outermost often with 2 short lateral lobes at the base. *Flowers* (in bud) with the hypanthium oblong or rectangular, ca. 1 mm long, glabrous, the calycine cup funnel shaped, ca. 0.8 mm long, glabrous outside and inside, eglandular within, the calycine lobes 5, subulate or lanceolate, ca. 3 mm long, slightly unequal, to 1 mm wide at the base, pubescent marginally; corolla white or orange, clavate in bud, to 7 mm long (10 mm long, fide Johnston), fleshy, petaloid, pubescent especially at the apex outside, glabrous and with numerous raphides within; stamens

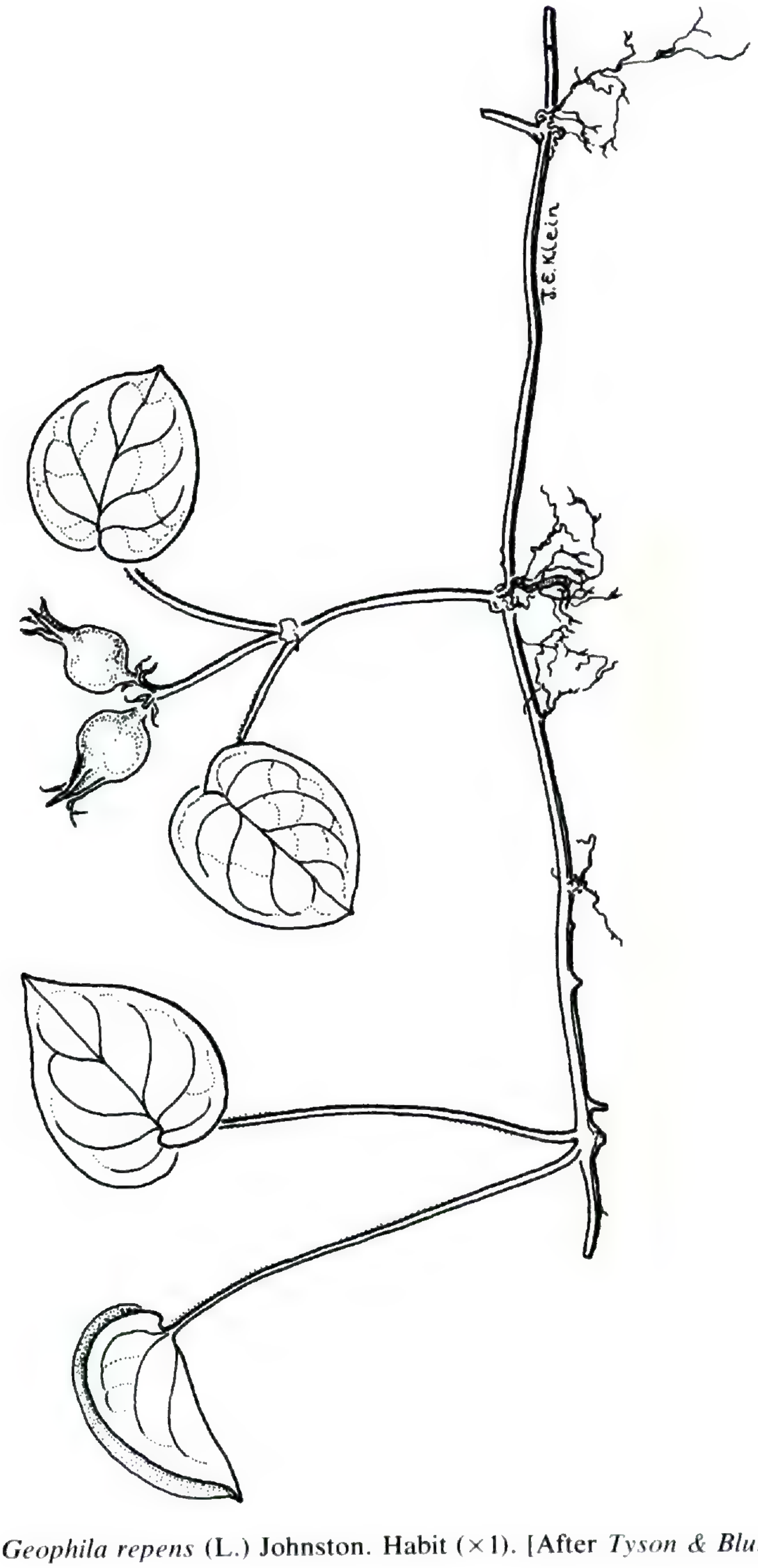

FIGURE 43. *Geophila repens* (L.) Johnston. Habit (×1). [After *Tyson & Blum 1658.*]

5, the anthers oblong, ca. 1 mm long, obtuse; style slender, the stigmatic lobes 2, short. *Fruits* red, ovate oblong, to 0.5 cm long; calyx cup and lobes persistent, to 3.5 mm long; seeds twisted and rugulose.

Geophila repens extends from Mexico throughout Central America, and in the Guianas, Venezuela, Colombia, south to Argentina. It also occurs in the West

Indies. *Duke 14345* notes that the herb is used medicinally by the Bayano Cuna Indians, who call it, "Nomas Puruiwat."

BOCAS DEL TORO: Changuinola, *Dunlap 565* (F). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2097* (MO). Pumpkin River, *Wedel 2577* (MO). CANAL ZONE: 2 mi from Gatún Locks, *Blum 1491* (MO). Summit Garden, *Mori & Kallunki 1885* (MO). Balboa, *Standley 25503* (MO). Old Fort Lorenzo, *Tyson 2207* (MO). Gamboa, *Tyson 4570* (MO). Fort Sherman, *Tyson & Blum 1658* (MO). Miraflores Lake, *White 252* (F). Salamanca Hydrographic Station, Río Pequeni, *Woodson et al. 1584* (F, MO). Vicinity of Summit Garden, *Witherspoon & Witherspoon 8700* (MO). BARRO COLORADO ISLAND: *Bailey & Bailey 3* (F); *Bangham 558* (F); *Bartlett & Lasser 16738* (MO); *Croat 4347, 5834, 6464, 7976, 10171, 10382, 15121* (all MO); *Ebinger 230* (F, MO); *Fosberg 48163* (MO); *Hayden 153, 1030* (both MO, UC, VEN); *Salvoza 967* (F); *Shattuck 130* (F, MO); *Starry 286* (F, MO); *Woodson & Schery 986* (MO). CHIRIQUÍ: San Bartolomé, Burica Peninsula, *Woodson & Schery 919* (F, MO). DARIÉN: Río Chico, from junction with Río Chucunaque to ca. 1 hour by outboard, *Burch et al. 1080* (MO). Pinogana near El Real, *Croat & Porter 15477* (MO). 10 mi S of El Real, Río Pirre, *Duke 5447* (MO). Río Pucro to Quebra Maskia, *Duke 13055* (MO). Quebrada "Comachimuricate" Correa Casa de Bartolo, *Kennedy 2854* (MO). Río Tuquesa, middle of Tuquesa Mining Co., camp called Charco Peje, *Mori 7054* (MO). Paya, Río Paya, *Stern et al. 431A* (MO). LOS SANTOS: Headwaters Río Pedregal, 25 mi SW of Tonosí, *Lewis et al. 2903* (MO). PANAMÁ: El Llano and Río Mamoní, *Duke 5553* (MO). Piria Cañasas Trail near Piria, *Duke 14345* (MO). Arraijan, *Woodson et al. 769* (MO).

42. GONZALAGUNIA

Gonzalagunia Ruiz & Pavón, Fl. Peruv. Prodr. 12. 1794. TYPE: *G. dependens* Ruiz & Pavón.

Duggena West, Bidar. Ste. Croix 269. 1793. Nomen nudum. TYPE: *D. richardii*, based on *Barleria hirsuta* Jacq.

Buena Cav., Anales Hist. Nat. 2: 278. 1800, not Pohl 1827. TYPE: *B. panamensis* Cav.

Gonzalea Pers., Syn. Pl. 2: 132. 1805. New name for *Gonzalagunia* Ruiz & Pavón.

Shrubs or small trees, the branchlets slender. *Leaves* petiolate or subsessile; stipules free, usually triangular subulate. *Inflorescences* terminal, elongate, slender, spiciform or thrysiform. *Flowers* with the hypanthium rotund, the calyx with 4–5 small, persistent lobes; corolla funnelform or salverform, the tube villous, the lobes 4–5, valvate or imbricate; stamens 4–5, the filaments slender, attached to the tube; anthers slender, included; ovarian disc crenulate, the style slender, the stigmas small, 2–4-lobed, the ovules numerous, the placentas small. *Fruits* baccate, globose, 2–4-sulcate, the pyrenes 2 or 4, chartaceous to bony; seeds numerous, minute, subglobose, deeply foveolate.

Gonzalagunia, a genus of about 25 species, is common throughout the American tropics and the West Indies. It is among the easiest genera of the Rubiaceae to recognize because of its pendent spiciform inflorescences.

Literature:

Donnell-Smith, J. 1899. Undescribed plants from Guatemala and other Central American Republics. Bot. Gaz. 27: 336.

Standley, P. 1921. New Rubiaceae from Colombia and Costa Rica. Contr. U.S. Natl. Herb. 17: 446.

———. 1929. Studies of American plants II: Rubiaceae. Field Mus. Nat. Hist., Bot. Ser. 4: 278–281.

a. Leaves 10–13 cm long; lateral veins of larger leaves 6–12.
   b. Largest bracts 5–8(–12) mm long; flowers blue; fruits dicoccus ..... 1. *G. bracteosa*

bb. Largest bracts 3–5 mm long; flowers white or red; fruits 4-coccus.
c. Leaves subsessile or with petioles to 0.3 cm long.
d. Stipules subulate, 8–9 mm long; calycine lobes ca. 2 mm long, obtuse ---- 3. *G. ovatifolia*
dd. Stipules ovate or deltoid, ca. 6 mm long; calycine lobes ca. 0.7 mm long, acute ---- 6. *G. rudis*
cc. Leaves with petioles 0.5–2.0 cm long.
e. Leaves 7–22 cm long; stipules 8–10 mm long, corolla pink, the tube ca. 8 mm long, densely appressed villose within ---- 5. *G. rosea*
ee. Leaves 5–13 cm long; stipules ca. 3 mm long; corolla white, the tube 10.0–13.5 mm long, glabrous within ---- 4. *G. panamensis*
aa. Leaves 15–24 cm long; lateral veins of larger leaves 12–16 (except *G. rosea*).
f. Lateral veins of larger leaves 12–16; flowers white.
g. Flowers pedicellate ---- 2. *G. kallunkii*
gg. Flowers sessile or subsessile ---- 7. *G. veraguensis*
ff. Lateral veins of larger leaves 6–12; flowers pink ---- 5. *G. rosea*

1. **Gonzalagunia bracteosa** (Donnell Smith) Robinson, Proc. Amer. Acad. Arts 45: 405. 1910.

Gonzalea bracteosa Donnell Smith, Bot. Gaz. 33: 252. 1902. TYPE: Guatemala, *Donnell Smith 6583* (F, NY).
Duggena bracteosa (Donnell Smith) Standley, Contr. U.S. Natl. Herb. 18: 125. 1916.

Shrubs 1.5–2.0 m tall, the lowermost branches occasionally prostrate, the branches smooth, glabrous to villose, wiry, to 0.15 cm in diam., the nodes often swollen, well spaced. *Leaves* oblong, obovate oblong or narrowly elliptic, 8–18(–22) cm long, 2.5–8.5 cm wide, widely deltoid or scarcely obtuse at the apex, short acuminate, the acumen to 1.5 cm long, acute, subcuneate or obtuse at the base, the costa prominulous above, prominent beneath, the secondary veins 6–9(–11), strongly arcuate ascending, the intervenal areas spreading reticulate, chartaceous, pubescent, the hairs 1.0–1.5 mm long, appressed, white, more dense beneath; petioles short or absent, to 0.5 cm long; stipules connate, cylindrical, the sheath closely appressed to stem, thin, densely golden villose or hirsute, occasionally carinate, the hairs more dense along the keel; each division tapering into an acute awn to 5 mm long. *Inflorescences* axillary, pendent, (5–)15–25 cm long, of ca. 20 flower clusters well spaced along an often flexuous rachis; peduncles 4–9 cm long; bracts several subtending the mass of flowers, deflexed, narrowly ovate lanceolate, 5–8(–12) mm long. *Flowers* sessile, the hypanthium and calycine cup subrotund, ca. 1.2 mm long, carnose, densely villose, the calycine lobes 5, to 0.5 mm long, densely villose outside, glabrous within, with a minute gland at the base of adjacent lobes; corolla blue (in bud), to 4 mm long, the tube apparently glabrous outside, villose within, the lobes 5, villose outside and within; stamens 5, the anthers oblong, to 1 mm long, minutely acuminate, affixed near the orifice; style and stigmas to 2.8 mm long, plano compressed, the style slender along most of its length, expanding above to 0.7 mm wide, the style and 2 stigmatic lobes sagittate, the lobes to 0.4 mm long; ovarian disc compressed cylindrical, to 0.2 mm long.

COLÓN: Río Guanche, ca. 3–5 km above bridge on Portobelo Road, *Croat 37012* (MO). Río Guanche, ca. 2.5 km upriver from bridge, road to Portobelo, *Mori et al. 6470* (MO). DARIÉN: Cocalito, *Dwyer 4560* (MO). Caná-Cuasí Trail (Camp 1), Chepigana, *Terry & Terry 1621* (F, MO). PANAMÁ: Campo Tres, 3 mi NE of Altos de Pacora, 500–800 m, *Croat 22701* (MO, US). El Llano-Cartí Road, *Croat 33763* (MO); *D'Arcy 10613* (MO); *Liesner 1201* (MO, US); *Mori et al. 4588* (MO); *Mori & Kallunki 5587* (MO).

2. **Gonzalagunia kallunkii** Dwyer.[50] TYPE: Panamá, *Mori & Kallunki 3141* (MO, holotype).

Shrubs to 2 m tall, the twiglets terete, smooth, the hairs short, dense, golden, the nodes well spaced, the pith occasionally porate. *Leaves* elliptic oblong, 17–24 cm long, 5.0–11.5 cm wide, acute, short acuminate, the acumen short, widely triangular, to 1.5 cm long, often slightly falcate, basally acute, cuneate to attenuate acute, the blade slightly decurrent on the petioles, the costa prominulous above, prominent beneath, the lateral veins 12–14, arcuate, the undulate submarginal vein to 3 mm from the margin, membranous, discolorous, dark red brown above when dry, dull gray green beneath, the hairs numerous, often appressed strigose, sometimes glabrescent; petioles to 2 cm long, rigid, lignose; stipules free, triangular, to 8 mm long, acute, with a median and densely bearded keel, the hairs golden. *Inflorescences* densely pubescent, to 35 cm long, to 2 cm wide; peduncle to 6 cm long, to 0.12 cm wide at the base. *Flowers* with pedicels to 0.5 cm long, the hypanthium and calycine cup compressed rotund, to 3 mm long, truncate, densely hairy, the calycine lobes 4, triangular, 1–1.5 mm long, hirsute outside, glabrous within; corolla white (in bud), the tube slender, 5.5–7.0 mm long, densely villose outside, glabrous within; stamens 4, subsessile, the anthers to 1.3 mm long, attached at base of tube; style 3 mm long, the stigmas ca. 0.7 mm long. *Fruits* white, rotund, ca. 0.5 cm in diam., densely appressed villose.

Gonzalagunia kallunkii is known only from Panama. It is named in honor of Jacquelyn Kallunki, who has contributed much to the collection of valuable herbarium material in Panama. It is closely related to *G. rosea* Standley which has pink flowers, fewer lateral veins, and glabrate fruit.

VERAGUAS: Valley of Dos Bocas, between Alto Piedra and Calovébora, 350–400 m, *Croat 27462, 27733* (both MO). NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3141* (MO).

3. **Gonzalagunia ovatifolia** (Donnell Smith) Robinson, Proc. Am. Acad. Arts 45: 405. 1910.

Gonzalea ovatifolia Donnell Smith, Bot. Gaz. 27: 336. 1899. SYNTYPES: Costa Rica: *Donnell Smith 6599, 6600* (both F); *Pittier & Tonduz 9171*; Panamá: *Hart 113*.
Duggena ovatifolia (Donnell Smith) Standley, Contr. U.S. Natl. Herb. 18: 126. 1916.

Shrubs to 3 m tall, the branchlets pubescent. *Leaves* subsessile, ovate oblong, to 10 cm long, to 5 cm wide, acuminate, the lateral veins (6–)8–12, discolorous, dark chocolate color above, lighter beneath, glabrescent above, sericeous beneath; stipules subulate, 8–9 mm long, triangular at the base, 2–3 mm wide.

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[50] *Gonzalagunia kallunkii* Dwyer, spec. nov. *Frutices* ad 2 m alti, ramulis laevibus aureo-puberulis. *Folia* elliptico-oblonga, 17–24 cm longa, 5.0–11.5 cm lata, acuta, acumine ad 1.5 cm longo, venis lateralibus 12–14, membranacea glabrescentia vel ciliis crebris appresso-strigosis; petiolis ad 2 cm longis; stipulis ad 8 mm longis carina media dense aureo-barbata ornatis. *Inflorescentiae* ad 35 cm longae floribus rare solitariae plerumque in fasciculis florium paucorum sessiles vel subsessiles bene distantes separatis. *Flores* hypanthio dense puberulo, rotundi, ca. 3 mm diam.; corolla alba tubo ad 7 mm longo extus ciliis appressis elongatis albis praedito, lobis ad 2.5 mm longis intus glabris. *Fructus* rotundi ad 0.5 cm diam., dense hirsuti.

Inflorescences terminal, (8–)17–27 cm long with peduncles 2–3 cm long or seemingly sessile and subtended by regular-sized leaves, the cymules 1–5-flowered, sessile, the bracts subulate, 3–5 mm long. *Flowers* with the hypanthium compressed rotund, ca. 1.5 mm long, the calycine lobes 4, oblong, ca. 2 mm long, usually curved, ciliate, with 1 to several rotund glands at the junction of the lobes; corolla white, the tube to 2 cm long, strigose, the lobes 4, obtuse, often as long as the tube; stamens 4, not exserted; ovarian disc pulvinate and bearing a few hairs, the style with the 4 stigmas included. *Fruits* tetracoccus, to 1 cm in diam. with white flesh persisting, hirsute, drying white ca. 3 mm in diam.; seeds angular, honeycomb reticulate.

This species is known only from Costa Rica, Colombia and Panama. Donnell Smith (1899) cited *Hart 113*, collected in Laguna de Chiriqui (Bocas del Toro), Panama in 1895.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 102* (F), *496* (F, BM). Without other locality, *Wedel 841* (MO). COCLÉ: La Mesa above El Valle, *Folsom 3653* (MO). SAN BLAS: Mainland opposite Achituppu, *Lewis et al. 100* (F, GH, MO). COLOMBIA: CHOCO: Trail between Alto Coriche and Camp Curiche, E of Boca Curiche, 10–400 ft, *Duke & Idrobo 11306* (NY).

4. **Gonzalagunia panamensis** (Cav.) Schum. in Mart., Fl. Bras. 6(6): 292. 1889.—FIG. 44.

Buena panamensis Cav., Anales Hist. Nat. 2: 279. 1800. TYPE: Panamá, *Nee* (?MA).
Gonzalea cornifolia H.B.K., Nov. Gen. Sp. Pl. 3: 416. 1820. TYPE: not seen.
G. panamensis Spreng., Syst. Veg. 1: 417. 1825. TYPE: Panamá, *Seemann 351* (BM, not seen; photo, MO).
G. leptantha A. Rich. in Sagra, Hist. Cuba 11: 16. 1850. TYPE: Cuba, *Ramon de la Sagra*, not seen.
Gonzalagunia leptantha Maza, Anales Soc. Esp. Hist. Nat. 23: 289. 1894. TYPE: not seen.
Gonzalea hayesii Wernham, J. Bot. 51: 219. 1913. TYPE: Panamá, Hayes (BM).
Duggena hayesii (Wernham) Standley, Contr. U.S. Natl. Herb. 18: 125. 1916.
D. leptantha (A. Rich.) Standley, Contr. U.S. Natl. Herb. 18: 125. 1916.

Shrubs to 10 ft tall, the branchlets terete, smooth, villosulose, the nodes well spaced, mostly 3–6 cm apart. *Leaves* elliptic or ovate elliptic, 5–13 cm long, 1–4(–6) cm wide, acute at the apex, usually acuminate, the acumen to 2 cm long, cuneate to subobtuse at the base, often markedly inequilateral, the costa prominulous above and beneath; petioles slender, 1.0–1.5(–2.0) cm long, ca. 0.8 mm wide, pubescent; stipules ovate oblong, widely triangular to subulate, to 3 mm long, the awn usually evident, weak, as long as or longer than the body. *Inflorescences* terminal, solitary, to 31 cm long, the peduncles flagelliform, 1.5–4.0 cm long, to 0.2 cm wide, pubescent, the cymules sessile or subsessile, 0.5–1.0 cm apart; bracts linear subulate or triangular subulate, shorter than the hypanthium or much longer, to 7 mm long, pubescent; pedicels short or absent. *Flowers* with the hypanthium subrotund, ca. 0.8 mm long, puberulent, the calyx ca. 1 mm long, the teeth 4, triangular, ca. 0.4 mm long, the cup stiffly petaloid, glabrous and eglandular within; corolla white, the tube narrowly cylindrical, 10.0–13.5 mm long (or longer), ca. 1 mm wide, petaloid, sparsely hairy outside, sometimes glabrescent, glabrous within, the lobes 4, oblong rotund, 3.2 mm long; stamens 4, the anthers narrowly oblong, 2.0–2.2 mm long, the filaments short, ca. 0.7 mm long, attached 3–4 mm below the mouth; style slender, 7–10 mm long, the stigmas

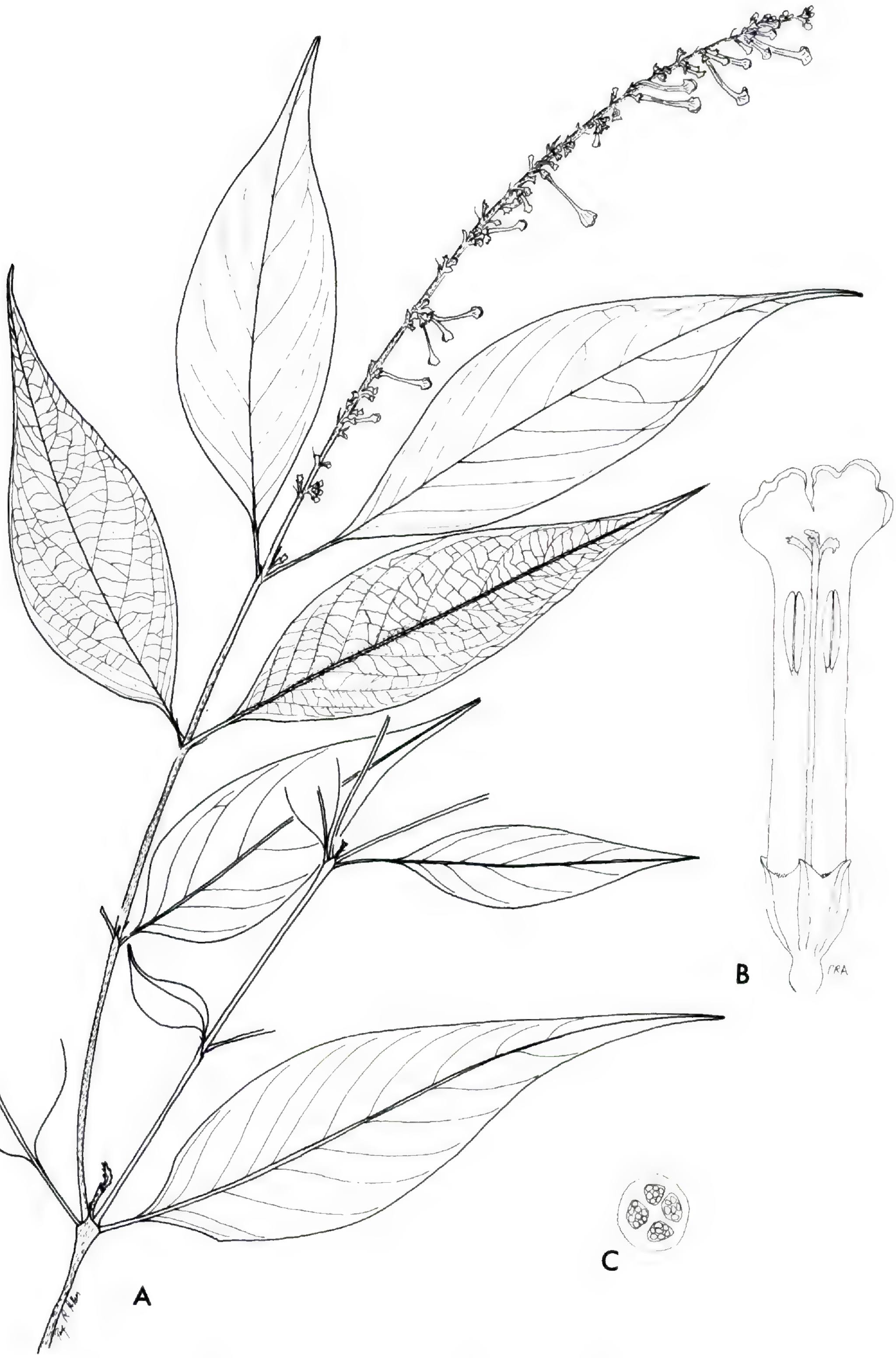

FIGURE 44. *Gonzalagunia panamensis* (Cav.) Schum.—A. Habit (×½).—B. Flower, opened to show stamens (×5½).—C. Ovary, cross section (×5½). [After *Tyson 1422*.]

4, ca. 0.7 mm long. *Fruits* 4-lobed, rotund, 3–4 mm in diam., glabrous to pubescent, white or purple black at maturity.

Gonzalagunia panamensis ranges from Mexico to Colombia, and it also occurs in the West Indies. A common name in Panama is "Niguita." *Stier 200* reports the common name "Ina Kapuriwiwa" by the San Blas Cuna Indians. Steyermark (1972) pointed out that *Gonzalagunia cornifolia* (H.B.K.) Standley (1929) is the "*Gonzalagunia panamensis* of Standley and other authors, not *G. panamensis* (Cav.) Schum," but he was referring to Standley's use of his name for plants of Venezuela, not his use of the name for plants of Panama.

Literature:

Steyermark, J. A. 1972. The Botany of the Guayana Highlands—Part IX. Mem. New York Bot. Gard. 23: 312.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 496* (BM, US). CANAL ZONE: Ancón, *Heriberto* (US). Cerro Luisa, Road C-2, *Croat 10773* (MO). Ft. Sherman, *Duke & Mussell 6639* (MO). Quarry Heights, *Dwyer 2608* (MO). Fort Sherman, *Dwyer 7183* (MO). Coco Solo, *Dwyer & Duke 7883* (GH, MO, UC, US). K-9 Military Road, *Ebinger 543* (MO). Balboa Heights, *Greenman & Greenman 5032* (MO). Ancón, *Killip 12052* (US). Gamboa, *Pittier 3711, 3785* (both US). Ancón, *Rowlee & Rowlee 396* (US). Ancón Hill, *Seibert 404* (MO). Balboa, *Standley 26977* (US). Corozal, *Standley 27358* (US). Fort Sherman, mouth of Chagres, *Tyson 1536* (MO). Fort San Lorenzo, *Tyson 2214* (MO). Miraflores, *White & White 57* (MO). CHIRIQUÍ: El Hato (Volcán), *Ebinger 816* (MO). Frances Arriba School, 14 mi N of David, *Lewis et al. 675* (GH, K, MO, NY). COCLÉ: El Valle, *Blum et al. 2381* (MO); *Duke 13271* (MO). Penonomé, *Dwyer 2010* (MO). El Valle, *Dwyer 2381* (MO). Near El Copé, *Garner 38* (MO). El Valle, *Seibert 428* (MO). COLÓN: Portobelo, *Croat 11412* (MO); *Elias & Kirkbride 1642* (MO, UC, VEN); *Folsom 3753* (MO); *Gentry 1738* (MO). N side Río Guanche, ½ km upstream from Puerto Pilón-Portobelo Highway, *Nee 7088* (MO). HERRERA: 10 mi S of Ocú, *Tyson 2844* (MO). PANAMÁ: Campana, *Allen & Alston 1865* (MO). Pacora and Chepo, *Dodge et al. 16667* (BM, MO). San José Island, *Erlanson 544* (US). Chagres, *Fendler 288* (MO). San José Island, *Johnston 76* (MO). Las Cumbres, *Rivera 18* (MO). Chepo, *Tyson 1422* (MO). Veracruz, *Wendehake 9* (MO). SAN BLAS: Between Río Diablo and Río Acuatí, near Narganá, *Duke 14859* (MO). Mainland opposite Achituppu, *Lewis et al. 100* (GH, MO). Niatuppu, *Stier 200* (MO). VERAGUAS: 5 mi NE of La Mesa, *Blum & Tyson 668* (MO). Santiago, *Dwyer 1253* (MO). Ponuga, *Dwyer & Kirkbride 7441* (GH, MO, US). Santiago, *Dwyer et al. 7557* (COL, MO, VEN, UC).

5. **Gonzalagunia rosea** Standley, Ann. Missouri Bot. Gard. 25: 836. 1938. TYPE: Panamá, *White & White 7* (F, holotype; isotypes, MO, NY).

Trees, small, to 5 m tall, or shrubs, the branchlets terete, stiff or flexuous, densely pubescent. *Leaves* oblong, ovate oblong or elliptic, 7–22 cm long, 2–8 cm wide, deltoid at the apex, often with an acumen to 1.5 cm long, basally cuneate or rounded, the costa prominulous above and beneath, the lateral veins 8–13, prominulous, arcuate, papyraceous, the hairs moderately dense, strigose or spreading, often farinose above (bases of deciduous hairs), usually densely golden villose beneath; petioles 0.5–2.0 cm long, 0.1–0.2 cm wide, pubescent; stipules oblong triangular or triangular, 8–10 mm long, acuminate, the acumen often 4 times the length of the body, keeled, golden pubescent. *Inflorescences* terminal, spiciform, 15–35 cm long, often nodding, to 5 cm wide, pubescent; peduncles to 4 cm long, to 0.18 cm wide, the cymules well spaced; bracts small. *Flowers* with the hypanthium obovoid, ca. 3 mm long, ca. 1.4 mm wide, villosulose, the calycine cup ca. 1 mm long, petaloid, the teeth 4–5, triangular, ca. 0.6 mm long, with 2–4 subrotund glands at the junction of the lobes; corolla pink, the tube slender, ca. 8 mm long, ca. 1.6 mm wide in the middle, densely pubescent outside, densely appressed and white villose within, carnose, the lobes 5, 2 mm long,

thick, the margins infolded, densely villose adaxially; stamens 4, the anthers oblong, ca. 2.5 mm long, ca. 0.25 mm wide, the filaments short, inserted ⅔ way up the tube; stigmas 4, unequal, subfalcately digitiform, 0.6–1.0 mm long, the style filamentous, ca. 9 mm long, the ovary 4-celled, thick-walled, the ovules numerous, rubescent. *Fruits* 4-coccous, 2–3 mm in diam., glabrate.

Gonzalagunia rosea is known from Costa Rica and Panama. *Mori & Dressler 7875* from Cerro Colorado, Chiriqui, is noteworthy in having glabrous leaves.

BOCAS DEL TORO: Between Quebrada Gutierrez and E slope La Zorra, *Kirkbride & Duke 737* (MO). CHIRIQUÍ: Cerro Horqueta, *Blum & Dwyer 2638* (MO). Bambito and Cerro Punta, *Croat 10676* (MO). Top of peak between Barú and Respinga, ca. 3000 m, *D'Arcy 10125* (MO). La Popa, above Boquete, *D'Arcy 10859, 10946* (both MO). Bajo Grande, *D'Arcy & D'Arcy 6561* (MO). Bajo Chorro, *Davidson 152* (MO, US), *259* (MO). Cerro Horqueta, *Duke et al. 13615* (MO); *Dwyer et al. 490* (MO, SCZ, UC, VEN). Boquete, *Dwyer 6992, 6995* (both MO). Cerro Horqueta, *Dwyer & Hayden 7702* (MO); *Dwyer & Lallathin 8774* (MO). El Volcán on road to Costa Rica, *Ebinger 816* (MO, US). Quebrada Hondo and divide on Caldera-Chiriquicito Trail, *Kirkbride & Duke 927* (MO). 27 km NW of El Hato del Volcán, 5000–5300 ft, *Mori & Bolten 7199* (MO). Cerro Colorado, 50 km N of San Félix, 1200–1500 m, *Mori & Dressler 7875* (MO). Cerro Punta, *Ridgway & Solis 2409* (MO, UC). Boquete, *Stern et al. 1028* (MO, US). 1 m SW of Cerro Punta, *Tyson 5646* (MO). Bambito, *Tyson 5861* (MO). Río Chiriqui Viejo Valley, *White & White 7* (F, MO), *80* (MO). Quebrada Velo, *Woodson & Schery 262* (MO). DARIÉN: Upper Río Membrillo and Camp 7, *Duke 10908* (MO). HERRERA: 10 mi S of Ocú, *Tyson et al. 2844* (MO). VERAGUAS: NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, Valley Río Dos Bocas, *Mori et al. 3841* (MO).

6. **Gonzalagunia rudis** (Standley) Standley, J. Wash. Acad. Sci. 17: 170. 1927.

Duggenia rudis Standley, Contr. U.S. Natl. Herb. 18: 125. 1916. TYPE: Panamá, *Pittier 2378* (US).
Gonzalagunia acutifolia Rusby, Descr. S. Amer. Pl. 131. 1920.

Small *trees*, to 3 m or shrubs, the branchlets terete, slender, 0.1–0.5 cm wide, puberulent, the nodes well spaced. *Leaves* ovate oblong, trapeziform oblong, often falcate and inequilateral, 3–11 cm long, 1–4 cm wide, deltoid to acute at the apex, acuminate, the acumen vague or to 1.5 cm long, acute, rounded, obtuse or occasionally truncate at the base, the costa prominulous above and beneath, the lateral veins 8–10, strongly arcuate, papyraceous, glabrescent or pubescent above, the hairs white, strigose, villose beneath, especially on the veins; petioles to 0.3 cm long, the blades sometimes sessile; stipules ovate or deltoid, ca. 6 mm long, the awn subulate, as long as the body, the body sometimes much reduced and the awn then to 5 times longer. *Inflorescences* terminal, occasionally appearing axillary as on reduced side branches, solitary, exceeding the terminal leaves, to 20 cm long, flagelliform, the peduncles 0.5–3.0 cm long, slender, to 0.1 cm wide, the flowers occasionally solitary or 3–4 in sessile or subsessile cymules, these 0.5–1.0 cm apart; bracteoles linear subulate, to 5 mm long. *Flowers* with the hypanthium rotund, ca. 1 mm long, truncate, villose, the calycine tube ca. 0.3 mm long, the teeth 4, unequal, triangular, ca. 0.7 mm long, obtuse to acute, with a minute gland in the sinuses; corolla white, the tube cylindrical, ca. 3 mm long, expanded at the apex, white villose on the outside and within, the lobes 4, oblong rotund, ca. 1.5 mm long, with papillae and hairs on upper surface; stamens 4, the anthers narrowly oblong, 1.0–1.3 mm long, the filaments slender, ca. 0.5 mm long, inserted near base of tube; style linear, 2.5–3.0 mm long, the stigmas 3–4, ca. 0.3 mm long. *Fruits* white, coccoid, rotund, to 0.5 cm in diam., fleshy, pubescent, the calycine lobes persistent, often radiating in starlike fashion.

Gonzalagunia rudis has a limited range, being known only from Panama and Colombia. In Panama it is known as "Niguita." Among the Bayano Cuna of Panama it is called "Usiburnu," "Puruiwat" and "Inna Ulu" (*Duke, 14460*). *Duke 14548* notes that it is used by the Choco Indians for snakebite. *Stier 177* lists the common names "Ipar kae Tummat" (San Blas) and "Ipa Kae" (San Blas) and notes that it is used in "Ibia ina" (apparently as a medicinal).

CHIRIQUÍ: 21 km WNW of Puerto Armuelles, *Busey 459* (MO). 4 mi S of Puerto Armuelles, *Liesner 379* (MO). CANAL ZONE: Mohinga Swamp, *Bartlett & Lasser 16856* (MO). Gamboa, *Clewell & Tyson 3217* (MO). Pipeline Road, *Croat 9383, 12341* (both MO). Pipeline Road, within 5 mi of Gamboa Gate, *D'Arcy 9285* (MO). Río Indio, *Dodge & Allen 17298* (MO). Gamboa, *Ebinger 904* (MO). Pipeline Road, *Gentry & Dressler 1967* (MO). 25 km NE of Cerro Azul on Río Piedras, *Mori & Kallunki 3367* (MO). Chagres at El Vigia, *Pittier 2378* (US). Gatún, *Standley 27180* (US). Frijoles, *Standley 27560* (US). Gamboa, *Tyson 1521* (MO). COLÓN: Tumba Vieja, *Dodge et al. 16935* (MO). DARIÉN: Río Tuquesa below Quebrada Venado, *Bristan 1033* (MO). Río Pirre, *Bristan 1314* (MO). Río Uruceca, *Bristan 1441* (MO). Río Chico, *Duke & Bristan 450* (MO). Río Tuira and Río Paca, *Duke 5029* (MO). Río Pirre, 10 mi S of El Real, *Duke 5450* (MO). Río Balsa, *Duke 8715* (MO). Río Sambú, *Duke 9306* (MO). Cerro Pirre, *Duke & Elias 13813* (MO, UC, VEN). Río Mortí, *Duke 14134* (MO). Trail near Piria, *Duke 14328* (MO). Cañasas and Sabalo, *Duke 14460* (MO). Río Tuira, *Duke 14548* (MO). Puerto Sta. Dorothea, *Dwyer 2275* (MO). Río Cuasí, *Kirkbride & Bristan 1439* (MO). Yaviza, *Stern et al. 147* (MO). Río Paya, *Stern et al. 365* (MO, US). LOS SANTOS: Río Pedregal, 25 mi SW of Tonosí, *Lewis et al. 2922* (COL, MO, UC, VEN). PANAMÁ: Río La Maestra, *Allen 22* (MO). Near Jenené, *Duke 3851, 3889* (both MO). El Llano to Río Mamoní, *Duke 5596* (MO). Piria-Cañasas trail near Piria, *Duke 14328* (MO). Fort Lorenzo, *Ebinger 458* (MO). Río Chagres, 5 mi SW of Cerro Brewster, *Lewis et al. 3443* (MO). 25 km NE of Cerro Azul on Río Piedras, 550 m, *Mori & Kallunki 3367* (MO). Río Chagres at El Vigía, *Pittier 2378* (MO). SAN BLAS: Puerto Obaldía, *Croat 16713* (MO). Río Cuadí, *Duke et al. 3658* (MO, UC, VEN). Cangandí-Mandinga Airport Road, *Duke 14789* (MO). Río Diablo and Río Acuatí, *Duke 14859* (MO). Isla Pino, near Mulatupo, *Elias 1702* (MO, UC). Playon Chico, Mainland, *Gentry 6413* (MO). Mainland opposite Achituppu, *Lewis et al. 132* (GH, K, MO, NY, UC, US). Alligandí, *Lewis et al. 143* (GH, K, MO, UC, US). Trail to inland village of Armila, 3–8 km SW of Puerto Obaldía, *Mori et al. 6800* (MO). Playon Chico, *Stier 157, 177* (both MO).

7. **Gonzalagunia veraguensis** Dwyer.[51] TYPE: Panamá, *Mori 6673* (MO, holotype).

Shrubs to 2 m tall, the twigs terete, golden velutinous, the nodes well spaced. *Leaves* elliptic or elliptic falcate, 5–25 cm long, 3–9 cm wide, deltoid or acute at the apex, acuminate, the acumen triangular, ultimately acute, cuneate to acute at the base, the costa prominulous above, prominent beneath, the lateral veins ca. 14, arcuate, not forming a distinct marginal vein, prominulous, usually with 1 short, soon branching or evanescent smaller vein between a pair of lateral veins, the numerous smaller veins arising from the veins often in a subperpendicular fashion, the intervenal areas spreading reticulate, rigidly papyraceous or subcoriaceous, discolorous, somewhat lustrous above, with a few scattered hairs on the costa and the veins above or in young leaves scattered over the upper surface, densely shaggy villose beneath, the hairs slender, appressed, to 2 mm long, more

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[51] *Gonzalagunia veraguensis* Dwyer, spec. nov. *Frutices* ad 2 m alti ramulis angulatis ciliis appresso-ferrugineis. *Folia* lanceolata, 15–28 cm longa, 4.5–8.5 cm lata, venis lateralibus 10–16 papyracea supra glabra praeter in costa venisque subtus dense pubescentia ciliis ad 2.5 mm longis. *Inflorescentiae* terminales, ad 50 cm longae, dense pubescentes, pedunculo ad 6 cm longo, cymis sessilibus, ad 4 cm latis, 1.0–2.5 cm distantibus; bracteis ad 0.5 cm longis. *Flores* sessiles; calyce lobis subulatis, 1.5–2.0 mm longis; corolla tubo cylindrico, ad 7.5 mm longo, extus ciliis crebris appressis, lobis 4, ca. 3 mm longis; antheris ca. 1.8 mm longis; stigmatibus 4 inaequalibus, ad 0.5 mm longis. *Fructus* non visi.

abundant on the costa and the veins; petioles 0.3–3.2 cm long, lignose, stout, pubescent; stipules often persistent, ovate or triangular, to 1.5 cm long, to 0.6 cm wide, acute, glabrous outside except for a densely pubescent median keel which arises from a densely pubescent broad basal band ca. 1.5 mm deep. *Inflorescences* terminal, solitary, spikelike, 15–60 cm long, to 2 cm wide, the flowers in well spaced aggregates; bracts linear, usually as long as the pedicels. *Flowers* sessile or subsessile; hypanthium rotund, ca. 2 mm long, sericeous, the calycine cup to 0.7 mm long, glabrous, often with a few irregular glands in the sinuses, the latter triangular or subulate, to 1.8 mm long, acute; corolla white, the tube narrowly cylindrical, to 7 mm long, thickly petaloid, the hairs outside dense, white, appressed, puberulent to sparsely ciliate within, the lobes 4, oblong, ca. 3 mm long, obtuse; stamens 4, the anthers ca. 1.8 mm long, obtuse, the filaments slender, almost equaling the anthers, inserted 1.5–3.0 mm above the base of the tube; ovarian disc annular, ca. 0.2 mm deep, the style ca. 3 mm long, the stigmas 4, unequal, digitiform, to 0.5 mm long. *Fruits* not seen.

Gonzalagunia veraguensis is known only from Panama. It is readily recognized by its many veined shaggy villose (beneath) leaf blades and its very short corolla.

VERAGUAS: Valley of Río Dos Bocas between Alto Piedra above Santa Fé and Calovébora, 350–400 m, *Croat 27462, 27733* (both MO). Near Escuela Agricola Alto de Piedra, *Mori 6673* (MO).

43. GUETTARDA

Guettarda L., Sp. Pl. 991. 1753; Gen. Pl., ed. 5: 428. 1754. TYPE: *G. speciosa* L.

Matthiola L., Sp. Pl. 1192. 1753, not R. Brown, (1812. Nomen conserv., Cruciferae). TYPE: *M. scabra* L.

Halesia P. Br., Civ. Nat. Hist. Jam. 205. 1756, nomen rejic. not J. Ellis ex L. 1759 (Nomen conserv., Styracaceae).

Laugeria Jacq., Enum. Pl. Carib. 2. 1760. TYPE: *L. odorata* Jacq.

Trees or shrubs. *Leaves* occasionally ternate, usually petiolate; stipules deciduous. *Inflorescences* axillary, cymose, the flowers occasionally solitary, usually secundly disposed or congested; bracteoles present or absent. *Flowers* with the hypanthium ovoid or globose, the calycine cup tubular, cupular or campanulate, truncate, edentate or 2–9-toothed; corolla funnelform or salverform, the tube elongate, the lobes 4–9, imbricate, 2 of them exterior; stamens 4–9, inserted in the tube, the anthers slender, dorsifixed, included, the filaments frequently wanting; style slender, the stigmas capitate or 2-lobed, the ovary 2–9-celled, the ovules 1 per cell, pendulous. *Fruits* drupaceous, globose, ovoid or oblong, thinly carnose, usually with a fine velvety indumentum, often acutely angular, the putamen ligneous or bony, the testa membranous.

Guettarda, a genus of about 80 species, occurs throughout tropical America. It also occurs in New Caledonia (fide Willis 1966).

a. Inflorescences with cymes 3-flowered; peduncles stout ..... 5. *G. ramuliflora*
aa. Inflorescences with cymes more than 3-flowered; peduncles slender.
  b. Leaves with lateral veins 6–10.
    c. Fruits obovate oblong, less than 2.2 cm long ..... 6. *G. sanblasensis*
    cc. Fruits rotund, 7.0–1.5 cm in diam.

d. Leaves 10–16 cm long; petioles to 2 cm long ..... 2. *G. foliacea*
dd. Leaves 2.0–5.5 cm long; petioles to 0.7 cm long ..... 4. *G. odorata*

bb. Leaves with lateral veins 10–12.
e. Leaves glabrate above; fruits compressed rotund, ca. 2 cm long, not sharply angled ..... 3. *G. macrosperma*
ee. Leaves villose or villosulose above; fruits oblong, to 0.8 cm long, sharply angled ..... 1. *G. chiriquiensis*

1. **Guettarda chiriquiensis** Standley, Ann. Missouri Bot. Gard. 25: 838. 1938. TYPE: Panamá, *White & White 22* (F, holotype; MO, isotype).—FIG. 45.

Trees to 30 ft tall, the branches terete or angular, the twiglets angular, stout, densely puberulent, the nodes usually well spaced. *Leaves* ovate rotund to lanceolate, 6.5–18.0 cm long, 2.5–12.5 cm wide, acute or somewhat rounded apically, frequently cuspidate, cuneate to occasionally obtuse or rounded at the base, rarely truncate, the costa prominulous above, prominent beneath, the lateral veins 10–11, prominulous, especially beneath, those in the lower ⅓ of the blade strict but marginally arcuate, those of upper ⅓ markedly arcuate, stiffly papyraceous to subcoriaceous, usually discolorous, villose or villosulose or both; petioles to 4.5(–10.0) cm long, usually rigid, densely pubescent; stipules often persistent at the ends of the branchlets, ovate or oblong, 12–13 mm long. *Inflorescences* axillary, 1 per axil, about as long as the petiole of the adjacent leaf, occasionally longer, the peduncles 1–2 cm long, densely golden pubescent, bifurcating, the branches 2.5–4.0 cm long, the flowers unilaterally disposed on the branch, usually 8–12 per branch. *Flowers* sessile; hypanthium oblong, ca. 2.5 mm long, the calycine cup ca. 1 mm long, the 4 teeth deltoid, ca. 0.5 mm long, densely pubescent outside, corolla white or purplish white, the tube narrowly cylindrical, ca. 12 mm long, ca. 1.5 mm wide in the middle, densely golden hirsute outside, the hairs deflexed, glabrous within, carnose, the lobes 4, oblong, the margin conspicuously lobed and scalloped, the whole ca. 6 mm long, and 5 mm wide at the base, glabrous within, puberulent outside; stamens 4, the anthers oblong, ca. 2.8 mm long, ca. 0.7 mm wide, obtuse, dorsifixed, the filaments plane, ca. 0.35 mm wide, attached just below the orifice; stigmas 2, oblong, 1 mm long, subconcave adaxially, the style 15–18 mm long. *Fruits* sessile, oblong, to 0.8 cm long, ca. 0.5 cm wide, the remnants of calycine cup persistent as an apiculum, sharply 4-angled and 4-sulcate, drying grey-green, the pubescence dense.

Guettarda chiriquiensis is known from Panama and Colombia but may be expected in adjacent Costa Rica. The solitary Colombian collection cited below occurs at a much lower elevation than the Panama collections.

CHIRIQUÍ: Between Cerro Punta and Las Nubes, 1800–2100 m, *Croat 26394* (MO). Valley of Río Chiriquí Viéjo, N of Volcán City, 5200–5600 ft, *Duke 9037* (MO). El Hato, 5000–6000 ft, *Ebinger 822* (MO). Boquete, 1400 m, *Maasola 28* (MO). 27 km NW of El Hato del Volcán, 5000–5300 ft, *Mori & Bolten 7189* (MO). Cerro Punta, 6000 ft, *Tyson 5820* (MO). Above Jaramillo Arriba, N slopes of Cerro Palo Alto, 4700 ft, *Webster 16684* (MO). Volcán de Chiriquí, 1700 m, *Woodson & Schery 508* (MO). COCLÉ: El Valle, *Correa 316* (MO). Cerro Pilón, *Duke 12111* (MO); *Dwyer 10566* (MO); *Dwyer & Correa 7946, 7975* (both MO); *Dwyer & Lallathin 8618* (MO). La Mesa, *Dwyer & Nee 11936* (MO); *Gentry 5637, 6837* (both MO). El Potroso, *Folsom & Collins 1554* (MO). Cerro Pilón, *Mori 6555* (MO). La Mesa, *Nee & Dwyer 9180* (MO). Cerro Pilón, *Porter et al. 4416* (COL, DUKE, MICH, MO, NY, SCZ, UC, VEN). PANAMÁ: Cerro Campana, *Correa & Dressler 368* (MO); *Croat 12158* (MO); *Dwyer & Kirkbride 7835* (MO); *Gentry 4917* (MO); *McDaniel 6857* (MO); *Mori & Kallunki 3572* (MO). COLOMBIA: CHOCO: Río San Juan just above Istmina, 100 m, *Gentry & Fallen 17650* (MO).

FIGURE 45. *Guettarda chiriquiensis* Standley.—A. Flowering branch (×½).—B. Flower (×1.5).—C. Ovary sections (×3). [After *Dwyer & Nee 11936.*].—D. Fruiting branch (×½). [After *Gentry 5637.*]

2. **Guettarda foliacea** Standley, Contr. U.S. Natl. Herb. 18: 139. 1916. TYPE: Panamá, *Pittier 4031* (US, holotype; isotype, F).

Trees, to 15 m tall, or shrubs, the twiglets terete, smooth, glabrous, ultimately pubescent, often with spreading lateral branches. *Leaves* often crowded at the apex of the twiglets, obovate oblong to elliptic, 3–17 cm long, 1.2–6.5 cm wide,

widely deltoid or rounded at the apex, the acumen short or absent, less than 1 cm long, basally obtuse or truncate, rarely acute or subcordate, usually inequilateral, the costa prominulous beneath, the lateral veins 8–10, arcuate, the veinlets pinnatiform, stiffly membranous or chartaceous, concolorous or discolorous, the hairs above white or scattered, the hairs beneath short or long, appressed or spreading, often strigose, appearing shaggy, the axils often barbate; petioles 0.8–2.0 cm long, slender, puberulent; stipules not seen. *Inflorescences* axillary, usually spreading, the peduncle slender, to 3 cm long, ca. 0.5 mm wide, pubescent, the few branches short and often secundly disposed; bracts deciduous, oblong, to 6 mm long, ca. 1 mm wide, sericeous, the calycine cup cupuliform, scarious, usually slightly longer than the hypanthium, sericeous, truncate, the teeth absent; corolla white, the tube narrowly cylindrical, to 1.5 cm long, ca. 1 mm wide in the middle, sericeous outside, glabrous within, the lobes 4–5, oblong, ca. 3 mm long, obtuse, thinly carnose, sericeous outside, the anthers subsessile, narrowly oblong, 3 mm long, attached ca. 2 mm below the mouth; style slender, the stigmas compressed, capitate rotund, ca. 0.25 mm long. *Fruits* sessile, rotund, 0.8–1.5(–2.0) cm in diam., finely velutinous, red at maturity.

Guettarda foliacea occurs in Panama and Colombia. "Guyababa"; "Espino."

BARRO COLORADO ISLAND: *Bailey & Bailey 202, 611* (both F); *Croat 6029, 6061, 6114, 6240, 6540, 7405, 7422, 7670* (all MO), *1145* (F), *11764* (MO), *15094* (F), *15160* (MO); *Dwyer 1416* (MO); *Ebinger 267* (MO), *390* (MO, US); *Foster 951, 1002* (both F); *Knight 69-1, 69-40* (both MO); *Shattuck 8* (F); *Starry 222* (F); *Zetek 3580* (MO). CANAL ZONE: Road S-11, NW of Escobal, *Croat 12471* (MO). Pipeline Road, *Croat 15094* (MO). Coco Solo, *Gentry 6191* (MO). Barbacoas Railroad Station, *Hayes 167* (F). Pipeline Road, *Mori & Kallunki 2051* (MO). Trinidad River, *Pittier 4031* (F, US). CHIRIQUÍ: Progreso, *Cooper & Slater 227* (US), *236* (F, US). DARIÉN: Río Ucurgantí, *Bristan 1175, 1178* (both MO). S of El Real, *Duke 5036* (MO). Río Chucunaque between Río Membrillo and Río Subcuti, *Duke 8602* (MO). Río Sabana, above Santa Fé, *Duke 14085* (MO). Piria-Cañasas trail near Piria, 100 m, *Duke 14310* (MO). Between Cañasas and Sábalo, *Duke 14478* (MO). El Real Quebrada, Trapiche, *Duke & Bristan 322* (MO). Campamento Buena Vista, *Stern et al. 957* (US). 2 mi E of Santa Fé, *Tyson et al. 4845* (MO). PANAMÁ: Río Chepo, Río Bayano, *Duke 3987* (MO). San José Island between Bodega Bay and Río Mata Puerco, *Duke 12552* (MO). Llanos of Río Mar, *Dwyer 1799* (MO). Río Pasiga, *Gentry 2287* (MO). Between Cañita and dam site, *Gentry & Tyson 1704* (MO). El Llano, road to Jesús María, *Tyson 6873* (MO). VERAGUAS: Río Trinidad, below Río de Jesús, *Dwyer 1321* (MO). Santiago, *Stern et al. 996* (MO, US). COLOMBIA: CHOCO: Behind beach, El Valle, sea level, *Gentry & Fallen 17231* (MO).

3. **Guettarda macrosperma** Donnell Smith, Bot. Gaz. 18: 204. 1893. TYPE: Guatemala, *Heyde & Lux 3160*, not seen.

Trees to 6 m tall, much branched, the twiglets terete, glabrous to pubescent, the nodes moderately well spaced, the lenticels minute, often inconspicuous. *Leaves* often crowded toward the apex of the twiglets, elliptic oblong, oblong rotund or occasionally pyriform, 12–20 cm long, 6–13 cm wide, deltoid to obtuse at the apex, acuminate, the acumen short, the apex of the blade often eroded, basally obtuse to widely cuneate, occasionally acute at the base, the costa prominent beneath, the lateral veins ca. 12, prominent, rigid, often light in color and contrasting with the rest of the blade, at first angular ascending then arcuate toward the margin, the ultimate veinlets vaguely lineolate, stiffly chartaceous, often brittle when dry, concolorous, glabrous or pubescent on the costa and the veins above, beneath with the hairs short, white, strigose, the vein axils often shortly barbate; petioles to 4 cm long, 0.10–0.25 cm wide, stiff, often curved,

glabrous to pubescent; stipules deciduous, not seen. *Inflorescences* axillary, the peduncles to 1.5 cm long, to 1.5 mm wide, stiff, the pubescence minute, green, velutinous. *Flowers* not seen. *Fruits* sessile, compressed rotund, ca. 2 cm wide, the pubescence minute, velutinous, yellow green or green when dry, delicately ribbed, the ribs disposed as faint and scarcely elevated lines, fruit wall thin; seeds 5–7, in a hard, white, pinkish or molasses-colored pulp.

Guettarda macrosperma extends from Guatemala to Panama. The Panamanian collections, while relatively abundant, lack flowers, making critical identification difficult. Donnell Smith in his original diagnosis describes the mature leaves of *G. macrosperma* as "2¾ × 1½ in." with "6–7 costal nerves." The fruits are described as "obovoid oblong (6–7 × 3–4 inches)." The leaves of Panamanian material are considerably larger, the lateral nerves are about 12, about double the number listed for the type which was collected at about 3,000 ft at Santa Rosa, Guatemala. The fruits of the Panamanian material do not exceed an inch in diameter while Donnell Smith describes the fruits as 4 inches in diameter. Unfortunately, I did not see the type to verify this incredibly large fruit. Paul Standley identified *Wedel 266* as *G. macrosperma*. It and *Carrasquilla et al. 387* have much smaller leaves even though the fruit is like that of the exsiccatae below. About ½ of the Panamanian material was collected near sea level in the limestone outcrops at Madden Dam.

CANAL ZONE: Madden Lake, *Croat 38326* (MO). Fort Sherman, *Duke & Mussell 6638* (MO). Madden Dam, Boy Scout Road, *Dwyer & Elias 7504* (GH, MO); *Dwyer & Hayden 20* (MO); *Ebinger* (MO). Area W of Limón Bay, Gatún Locks, *Johnston 1704* (MO). Madden Dam, Boy Scout Road, *Kirkbride 42* (MO); *Kirkbride & Elias 260* (MO); *Lewis et al. 15* (GH, K, MO, NY, UC, US). Pipeline Road, 4 km NW of Gamboa, *Nee 7225* (MO). Sotto Caballo, *Smith et al. 3318* (F, MO). COLÓN: Río Boquerón, 3 km from La Pelona, *Carrasquilla et al. 387* (MO). Between Garotte and La Guaira, *D'Arcy 9349* (MO). Portobelo, *Dwyer 5149* (MO). María Chiquita, *Dwyer & Kirkbride 7772* (GH, MO, UC, US). DARIÉN: Santa Fé, *Duke 14085* (F). SAN BLAS: Ustupo, *D'Arcy 9534* (MO). Ailigandí River, *Duke & Bristan 349* (MO). Río Guadí, Camp Diablo, drill site 22, *Duke et al. 3646* (MO). Isla Pino near Mulatupo, 200 ft, *Elias 1705* (MO, UC).

4. **Guettarda odorata** (Jacq.) Lam., Tab. Encycl. Méth. 2: 219. 1819.

Laugeria odorata Jacq., Enum. Pl. Carib. 16. 1760. TYPE: Cuba, *Jacquin*, not seen.

Shrubs or trees, to 3.5 m tall, the branchlets terete, distichous, well spaced, the bark drying dull grey, often mottled, occasionally conspicuously lenticellate. *Leaves* oblong, 2.0–5.5 cm long, 1.0–2.5 cm wide, cuneate to rounded at the apex, acuminate, the acumen vague, basally cuneate, obtuse or vaguely rounded, the costa plane, immersed or prominulous above, prominent beneath, the lateral veins (6–)8–9, arcuate, the veinlets lineolate, irregularly perpendicular to lateral veins, the intervenal areas often mosaic-like, papyraceous, glabrate above, villose or merely puberulent on the costa and the veins as well as the intervenal areas, below the hairs of the veinlets occasionally shaggy; petioles 0.2–0.7 cm long, slender, puberulent or villose, often curved; stipules ovate deltoid, ca. 2 mm long, acute, pubescent. *Inflorescences* axillary, 1–2 per axil, 3–5 cm long, the peduncles 1.5–3.0 cm long, capillaceous or wiry, to 0.5 mm wide, pubescent, producing 1 cymule at the apex, this usually 5-flowered, or bifurcating and producing a pair of 5–8-flowered cymules. *Flowers* sessile or subsessile; hypanthium subrotund,

ca. 1 mm long, carnose, the calycine cup ca. 2.5 mm long, carnose, eglandular within, the teeth absent; corolla white or reddish, the tube narrowly cylindrical, to 16.5 mm long, ca. 1 mm wide, puberulent outside, glabrous within, the lobes (4–)5(–6), oblong, 2.5–4.2 mm long, thinly carnose; stamens (4–)5, the anthers linear oblong, 1.5–3.0 mm long, ca. 0.2 mm wide, dorsifixed, subsessile or sessile, occasionally the filaments as long as the anthers, attached immediately below the mouth or at the upper ⅔ of the tube, the ovarian disc annular, the style linear, 8–14 mm long with appressed ascending hairs, the stigmas 2(–3?), capitate, ca. 0.2 mm long, slightly wider than the style. *Fruits* rotund, to 0.7 cm in diam., the persistent calycine cup to 1.3 mm long, the pericarp smooth, wrinkled when dry, minutely grey green, puberulent, the hairs eventually deciduous.

Guettarda odorata occurs in Panama and in northern South America. It has also been reported from the West Indies. "Espino Blanco"; "Huesio Negro." Steyermark (1972) discusses in detail his designation of a Jacquin collection from Cuba as the lectotype.

CANAL ZONE: Fort Kobbe, *Allen 1407* (F); *Duke 3957, 4241* (both MO). Farfan Beach, *Dwyer & Hayden 7532* (GH, MO, US). Barro Colorado Island, *Ebinger 267* (MO). Survival School, Curundú, *Tyson 1059* (MO). Fort Clayton, *Tyson 6779* (MO). Miraflores Lake (?), *White 139* (MO). Ancón Hill, *Woodson et al. 1331* (F, MO). Fort Kobbe, *Woodson et al. 1407* (MO). CHIRIQUÍ: 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 428* (MO). COCLÉ: Penonomé, *Dwyer 2033* (MO). DARIÉN: Mouth of Río Yapé, *Allen 371* (F, MO). Río Pirre, *Duke 4962* (MO). Río Cucunatí at Puente Quemado, *Duke 8806* (MO). HERRERA: Ocú, *Ebinger 1062* (MO). La Cabuya, Las Minas, *Lao 139* (MO). PANAMÁ: Pedro Gonzales, *Allen 2597* (F). Calzada Larga, *Croat 12385* (MO). Río Mar, Savanna, *Duke 12426* (MO). Isla Taboga, *Hayes 637* (F). Las Sabanas, *Pittier 6702* (F). San José Island, *Stimson 5326* (MO). Isla Taboga, *Woodson et al. 1482* (F, MO). E of Pacora, *Woodson et al. 723* (F, MO). VERAGUAS: 5 mi N of Santiago, Río Santa María, *Blum & Tyson 616* (MO). 5 mi NE of La Mesa, *Blum & Tyson 667* (MO). 2 mi W of Santiago, Transisthmian Highway, *Dwyer et al. 7544* (GH, MO). Quebrada S of Santa Fé, 450 m, *Nee 8040* (MO). San José, Santiago-Santa Fé Road, 400 m, *Nee 8170* (MO).

5. **Guettarda ramuliflora** Beurl., Kongl. Vetensk. Acad. Handl. 132. 1854. TYPE: Panama, *Billberg* (S).

Trees, to 8 m tall or shrubs, the twigs terete, puberulent, ultimately finely velutinous, the nodes well spaced. *Leaves* ovate oblong or sagittate, 6–9 cm long, 3–5 cm wide, acute to widely deltoid at the apex, acuminate, the acumen short, somewhat vague, obtuse to widely deltoid at the apex, acuminate, the acumen short, somewhat vague, obtuse to widely cuneate at the base, the costa prominulous above, prominulous beneath, the lateral veins 6–8, arcuate, with short, white, appressed, striate, densely appressed hairs on the costa and the veins beneath, the intervenal areas lineolate but not conspicuously so, concolorous, membranous; petioles slender, 1–3 cm long, ca. 0.1 cm wide, appressed villosulose; stipules not seen. *Inflorescences* axillary, to 3.5 cm long, the peduncle stout, to 1 cm long, velutinous, the flowers few, the cymes 3-flowered (fide Standley 1928) crowded at the end of the peduncle. *Flowers* sessile, villose; hypanthium broader than long, 1 mm long, the calycine cup turgid, cupuliform, ca. 3 mm long, truncate, edentate; corolla white, the tube narrowly funnelform, to 2.2 cm long, to 0.2 cm wide, carnose, villose outside, glabrous within, the lobes 5, oblong, to 5 mm long, to 3.5 mm wide, obtuse, the margin with occasional shallow

notches; stamens 5, sessile, the anthers narrowly oblong, obtuse, acutely sagittate at base, attached ca. 3 mm below the mouth, the ovarian disc cylindrical, 1.3 mm long, villosulose at the base, truncate, the style linear, ca. 7.5 mm long. *Fruits* not seen.

Guettarda ramuliflora is known only from Panama.

PROVINCE UNKNOWN: *Billberg* (S). CANAL ZONE: Devil's Beach, woods back of beach, NW part of Canal Zone, *Johnston 1717* (MO).

6. **Guettarda sanblasensis** Dwyer.[52] TYPE: Panamá, *Duke et al. 3646* (MO, holotype).

Trees 15–20 m tall, the branchlets terete, ultimately puberulent, the nodes moderately well spaced. *Leaves* elliptic or elliptic rotund, 5–14 cm long, 4–10 cm wide, toward the apex, rounded, deltoid, subacute or acuminate, the acumen inconspicuous or to 1.5 cm long, ultimately acute, at the base cuneate or widely cuneate, the costa plane above, prominulous beneath, the lateral veins 8–10, arcuate, the venules pinnatiform, rigidly chartaceous, concolorous, green, shining, the hairs on both sides minutely strigose, those on the veins appressed, short, velvety; petioles to 3 cm long, ca. 0.12 cm wide, stiff; stipules not seen. *Inflorescences* axillary, the peduncle to 3 cm long, pubescent, the branches to 3 cm long. *Flowers* not seen. *Fruits* obovate oblong, to 2.2 cm long, to 1.2 cm wide, subtruncate at the apex, minutely velutinous, yellow green when dry, attenuate toward the apex, the calycine cup ca. 2 mm long, ca. 1.5 mm wide.

Guettarda sanblasensis is known only from Panama. It is distinguished by its apically subtruncate fruit.

SAN BLAS: Headwaters of Río Cuadí, Camp Diablo, drill site 22, N 82.2, E 87.8, 273 ft, *Duke et al. 3646* (MO, holotype).

44. HAMELIA

Hamelia Jacq., Enum. Pl. Carib. 16. 1760. LECTOTYPE: *H. erecta* Jacq. = *H. patens* Jacq.

Hamellia L., Sp. Pl., ed. 2, 246. 1762, orth. mut. = *Hamelia* Jacq.
Tangaraca Adans., Fam. Pl. 11: 147. 1763. TYPE: not indicated.
Lonicera Adans., Fam. Pl. 11: 157. 1763. Not *Lonicera* L. (1753). TYPE: not indicated.
Duhamelia Pers., Syn. Pl. 2: 203. 1805. TYPE: not indicated.
Tepesia Gaertn., Fruct. Sem. Pl. 3: 72. 1805. TYPE: *T. dubia* Gaertner.

Shrubs or small *trees*. *Leaves* opposite or in whorls of 3–5, petiolate; stipules free, entire or 3-lobed, small. *Inflorescences* terminal, of thryses, dichasia or cymes, the floral axes often spreading, the flowers usually secund; bracts deciduous. *Flowers* with the hypanthium 5-lobed, the lobes often reduced, persistent

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[52] *Guettarda sanblasensis* Dwyer, spec. nov. *Arbores* 15–20 m altae. *Folia* elliptica vel elliptico-rotunda, 5–14 cm longa, 4–10 cm lata, venis lateralibus 8–10 arcuatis, rigido-chartacea; petiolis ad 3 cm longis. *Inflorescentiae* in fructu axillares pedunculo ad 3 cm longo. *Flores* haud suppetunt. *Fructus* obovato-oblongi, ad 2.2 cm longi, ad 1.2 cm lati, minute velutini in sicco luteo-virides cupula calycis 2 mm longa, 1.5 mm lata coronati.

in fruit; corolla tubular or inflated, orange, red or yellow, the lobes 5, imbricate; stamens 5, the connectives produced apically, the filaments attached at the base of the corolla; ovary (4–)5-celled, the style slender, the stigmas 1–5. *Fruits* fleshy, the ovarian disc often persistent and forming a truncated cone; seeds numerous, plano compressed, foveolate.

Hamelia ranges from southern Florida through Mexico, Central America, the West Indies and South America. There are about 16 species in the genus.

Literature:

Elias, T. 1976. A monograph of the genus *Hamelia* (Rubiaceae), Mem. New York Bot. Gard. 26(4): 81–144.

Wernham, H. F. 1911. A Revision of the Genus *Hamelia*. Jour. Bot. London 49: 206–216.

a. Corolla funnel shaped, yellow (sect. Amphituba).
  b. Corolla tube 1.0–1.3 cm long; fruits 0.5–0.7 cm long ---------- 1. *H. axillaris*
  bb. Corolla tube 1.8–5.0 cm long; fruits 7–16 mm long.
    c. Calycine lobes 3–5 mm long; stipules subulate ---------- 2. *H. calycosa*
    cc. Calycine lobes 0.2–2.5 mm long; stipules triangular to ovate.
      d. Corolla tube 4–7 mm broad at the apex; inflorescence 10–25-flowered ---- 8. *H. xerocarpa*
      dd. Corolla 10–20 mm broad at the apex; inflorescence 4–15-flowered ------- 3. *H. macrantha*

aa. Corolla tubular, yellow, orange or red (Sect. Hamelia).
  e. Lateral veins 3–5 pairs.
    f. Inflorescence a much reduced dichasium, flowers usually 2–5; leaves 0.8–2.8 (–4.8) cm broad ---------- 7. *H. sanguinea*
    ff. Inflorescence a spreading dichasium or cyme, flowers 3–8; leaves 2–7 cm broad ---------- 6. *H. rovirosae*
  ee. Lateral veins 5–11 pairs.
    g. Floral parts and leaves densely villous.
      h. Leaves with lateral veins 3–5 pairs; seeds 1.0–1.2 mm long ---------- 6. *H. rovirosae*
      hh. Leaves with lateral veins 7–10 pairs; seeds 0.6–0.9 mm long ---- 5. *H. patens*
    gg. Floral parts and leaf undersides glabrous to puberulent.
      i. Flowers 12–15 mm long; leaves with 11–16 pairs of lateral veins; corolla yellow ---------- 4. *H. magnifolia*
      ii. Flowers 15–25 mm long; leaves with 7–10 pairs of lateral veins; corolla yellow to red ---------- 5. *H. patens*

1. **Hamelia axillaris**[53] Swartz, Nov. Gen. Sp. Pl. Prodr. 46. 1788. LECTOTYPE: (Elias, 1976): Jamaica, *Swartz* (S).

Shrubs to 4 m tall, the branchlets terete to angular, glabrous to puberulent. *Leaves* opposite or rarely ternate, elliptic, narrowly elliptic or obovate, 5–17 cm long, 2–7 cm wide, acuminate at the apex, often conspicuously so, attenuate at the base, glabrous above, often puberulent beneath and barbate in the vein axils, the lateral veins 8–11, arcuate, chartaceous to membranous, glabrous or sparsely puberulent; petioles 1–4(–6.5) cm long, occasionally densely puberulent; stipules triangular, 2–6 mm long. *Inflorescences* axillary and terminal, of few- to many-flowered compound dichasia, often disposed as scorpioid cymes; peduncles to

[53] For a list of synonyms see Elias (1976). Only this name has been used for Panamanian material.

1.5 cm long, the branches 1.5–4.5 cm long, spreading; bracts ovate, ca. 0.5 mm long, puberulent. *Flowers* sessile or on pedicels to 1 mm long, sparsely puberulent; calycine lobes to 1.5 mm long, puberulent, often densely so; corolla yellow, the tube infundibular, expanding at the apex, to 11.5 mm long, the lobes ovate, to 2 mm long, puberulent to glabrous; anthers 5–7 mm long, the apiculum ca. 0.5 mm long, the filaments to 5 mm long, the style slightly shorter than the tube, the stigmas ca. 1.2 mm long. *Fruits* globose or subglobose, 5–7 mm long, ultimately black; seeds ca. 1 mm long.

Hamelia axillaris is a weedy shrub extending from Mexico through Central America to northern South America. It also occurs in the West Indies.

CANAL ZONE: Road S-10, N of Escobal near junction of Road S-1, *Croat 12484* (MO). Río Mendosa, Navy Reservation, 8 km N of Gamboa, *Dressler 4087* (MO). Camp Piña, Fort Sherman, *Duke 4398* (MO). Madden Dam, Boy Scout Road, *Dwyer & Elias 7491* (GH, MO, UC, US). N base of Mindi Hills, *Johnston 1637* (MO). BARRO COLORADO ISLAND: *Croat 6299, 10940, 11862, 11901* (all MO); *Hayden 150* (MO); *Starry 284* (MO). COLÓN: Portobelo, *Ebinger 118* (MO). DARIÉN: Río Tuqueza, below Quebrada Venado, *Bristan 1034* (MO). Río Aruza, *Bristan 1367* (MO). Río Balsa between Quebrada Chusomocatre and Río Aretí, *Duke 8718* (MO). Quebrada Madkia off Río Pucro above Pucro, *Duke 13013* (MO). Tumaganti, *Duke 14160* (MO). Río Tuira between Río Punusa and Río Mangle, *Duke 14635* (MO). Between Río Perrecénega and Rancho Frío, *Duke & Elias 13860, 13867* (both GH, MO, US). Between Paya and Palo de Los Letras, *Duke & Kirkbride 14034* (MO). Río Tuquesa, Middle Tuquesa Mining Co. Camp called Charco Peje, *Mori 7090* (MO). Between Río Escucha Ruido and Río Tuira, *Stern et al. 578* (MO). Caná, 1750 ft, *Stern et al. 670* (MO). Campamento Buena Vista, Río Chucunaque, *Stern et al. 828* (MO). 3 mi E of Santa Fé, *Tyson et al. 4715* (MO). LOS SANTOS: Los Toretos, *Dwyer 2424* (MO). PANAMÁ: Piria-Cañasas Trail near Piria, ca. 100 m, *Duke 14331* (MO). Cerro Azul, ca. 2000 ft, *Dwyer 2072* (MO). Within 2 mi of Achiote, *Folsom 3871* (MO). Dam site near Río Bayano beyond Chepo, *Gentry & Tyson 1676* (MO). Cerro Campana, *Mass et al. 1731* (MO); *Mori & Kallunki 1937* (MO); *Webster & Breckon 16510* (MO). Gorgas Memorial Laboratory, ca. 25 km NE of Cerro Azul, Río Piedras, 550 m, *Mori & Kallunki 3459* (MO).

2. **Hamelia calycosa** J. D. Smith, Bot. Gaz. 12: 132. 1887. TYPE: Guatemala, *Tuerckheim 454* (US, holotype; NY, isotype).

H. chiapensis Brandegee, Univ. Cal. Publ. Bot. 6: 71. 1914. TYPE: México, *Purpus 7030* (F, MO, NY).

H. boyacana Standley, Field Mus. Nat. Hist., Bot. Ser. series 11(5): 213. 1936. TYPE: Colombia, *Lawrance 503* (NY, holotype, MO, US).

H. klugii Standley, Field Mus. Nat. Hist., Bot. Ser. 13. No. 364: 96. 1932. TYPE: Perú, *Klug 3664* (F, holotype).

Shrubs or *trees* to 10 m tall, the twiglets terete, smooth, glabrous, ultimately puberulent, branching freely, the nodes well spaced. *Leaves* oblong, often 3–4-nate at the ends of twigs, lanceolate or trapeziform lanceolate, 1.5–11.0 cm long, 0.9–3.5 cm wide, tapering acutely at the apex, acuminate, the acumen ca. 0.7 cm long, acute to cuneate at the base, the costa grooved, plane or prominulous above, the lateral veins 4–7(–9), arcuate, membranous or papyraceous, glabrous above and beneath except occasionally pubescent on the costa beneath, often barbate in the vein axils beneath; petioles slender, 0.8–2.0 cm long, wiry, glabrate; stipules subulate, to 2.5 mm long, puberulent. *Inflorescences* terminal, rarely axillary, the scorpioid cymes lax and spreading, the flowers many in 3–4 fascicles; peduncles to 2 cm long, often minutely puberulent, the floral axes with up to 4 flowers, 0.6–4.0 cm long; bracts triangular to subulate, to 2 mm long, glabrous. *Flowers* secund, the pedicels to 5 mm long; hypanthium oblong, puberulent, the

calycine cup scarcely measurable, the lobes oblong, to 1.5 mm long, fleshy, puberulent; corolla pale orange or yellow, striped maroon, the tube somewhat infundibuliform, 30 mm long, constricted narrowly at the base, the base ca. 1.5 mm wide, ca. 7.5 mm wide in the middle of the tube, ca. 1 cm wide at the mouth, puberulent outside, glabrous within, the lobes ovate, to 6 mm long; stamens 5, the anthers linear oblong, to 2 cm long, ca. 1 mm wide, the connective extended apically as a rotund petaloid appendage, ca. 0.75 mm long, sagittate at the base, the filaments plane, ca. 4 mm long, attached ca. 6 mm from the base of the tube; style to 15 mm long, the stigmas 5, connate into a mass, to 1.5 mm long. *Fruits* cylindrical, 7–15 mm long, 4–6 mm wide, the ovarian disc conical and truncate; seeds to 1.2 mm long, minutely foveolate.

Hamelia calycosa extends from Mexico to Peru.

COCLÉ: N rim of El Valle, *Allen 1785* (GH, MO, NY). Cerro Pilón, 700–900 m, *Duke 12151* (MO). Cerro Pilón, *Duke & Dwyer 13898* (COL, MO, SCZ, UC). N of El Valle, *Lewis et al. 1797* (COL, DUKE, K, MO, UC). La Mesa, 850 m, *Mori 6599* (MO). PANAMÁ: Río Cascada, 300–400 m, *Correa & Dressler 1652* (MO). VERAGUAS: Alto Piedra, Santa Fé, 1200 m, *Lao 515* (MO).

3. **Hamelia macrantha** Little, Caribbean Forest. 9: 274. 1948. TYPE: Ecuador, *Spruce 6193* (K, holotype, not seen).

H. grandiflora Spruce, in Wernham, J. Bot. 49: 209. 1911. LECTOTYPE: Brazil, *Spruce 6193* (K, holotype; photo, MO); SYNTYPE: Colombia, *Triana 1759* (F, frag.). Not L'Heritier, 1788.

Shrubs or *trees* to 5 m tall, the branchlets terete, ultimately angular, minutely puberulent, the nodes well spaced. *Leaves* ternate toward the apex, broadly oblong to ovate, 13–23 cm long, 4–15 cm wide, rounded, obtuse or widely deltoid at the apex, rounded, subtruncate to cuneate basally, the costa plane to prominulous above and beneath, the lateral veins 11–15, membranous to chartaceous, glabrous above, glabrous to rufous puberulent beneath; petioles 6.0–9.5 cm long, glabrous or puberulent; stipules ovate, 3.1–3.5 mm long, acute, glabrous or rarely pubescent. *Inflorescences* terminal or axillary, the dichasia many flowered; peduncle terete, to 8 cm long, the floral axes to 2 cm long; bracts ovate, to 0.7 mm long, acute, glabrate to villosulose. *Flowers* sessile or on pedicels to 2 mm long; hypanthium 3–5 mm long, the calycine cup scarcely measurable, the lobes triangular to ovate, to 1.3 mm long, acute, glabrous to tomentose; corolla yellow, the tube infundibular, 2–3 cm long, constricted basally, glabrous, the lobes ovate, to 4 mm long, glabrous; stamens included, the anthers to 20 mm long, the connective produced at the apex, ovate, ca. 1 mm long, sagittate basally; style to 20 mm long, the stigmatic lobes linear, 5–8 mm long. *Fruits* ellipsoid, to 1.5 cm long, red to finally lustrous black at maturity; persistent ovarian disc conical and truncate; seeds to 1 mm long, delicately foveolate.

Hamelia macrantha ranges from Costa Rica south to Ecuador.

CANAL ZONE: Pipeline Road, Agua Salud, *Kennedy & Andrews 1894* (MO). COLÓN: Río Guanche, *Correa et al. 1898* (MO). COCLÉ: N of El Valle, road to La Mesa, 1000 m, *Allen 3724* (MO). El Valle near La Mesa, *Correa & Dressler 1000* (MO). Between Cerro Pilón and El Valle, *Duke & Dwyer 13939* (MO). El Valle, ca. 2200 ft, *Dwyer 1913* (MO). Cerro Pilón, 900 m, *Dwyer & Lallathin 8625, 8632* (both MO). El Valle, ca. 1000 m, *Gentry 5694* (MO). Cerro Pilón, *Lallathin 10-4, 28-C* (both MO). PANAMÁ: El Llano Cartí-Tupile Road, 12 mi above Panamerican Highway, *Liesner 1236* (MO).

4. **Hamelia magnifolia** Wernham, J. Bot. 49: 210. 1911. TYPE: Guatemala, *Standley 64569* (F, holotype; NY, US, isotypes).

Shrubs or small *trees*, to 6 m tall, the branchlets angular to tetragonal, glabrous, the nodes well spaced. *Leaves* rarely ternate at the tips of the branchlets, ovate to ovate elliptic, occasionally puberulent; petioles 1.0–5.5 cm long; stipules deltoid, 4–7 mm long, to 2 mm wide at the base, glabrate. *Inflorescences* terminal, of compound dichasia, often appearing cymose, the floral clusters numerous and many flowered; peduncle to 3 cm long. *Flowers* with the calycine cup to 2.5 mm long, the lobes deltoid, ca. 0.6 mm long or shorter, puberulent marginally; corolla yellow, the tube 7.5–12.0 mm long, glabrous except often minutely puberulent at the base, the lobes to 1.5 mm long, about as broad at the base; anthers narrowly oblong, 6–8 mm long, the connective produced apically as an ovate or deltoid appendage, ca. 1 mm long, falcate and ultimately acuminate, basally sagittate. *Fruits* oblong, to 1 cm long or longer; persistent ovarian disc ca. 1 mm long.

Hamelia magnifolia is known only from Costa Rica and Panama. *Kirkbride & Duke 757* list the common name "Ojo movado."

BOCAS DEL TORO: Gualaco, Cerro Galera Chorca, *Allen 5055* (F). CHIRIQUÍ: San Bartolo Arriba, W of Puerto Armuelles, *Croat 26705* (MO). Chiriquicito-Calderas Trail between Quebrada Higueron and Gutierrez, *Kirkbride & Duke 757* (MO). Puerto Armuelles, *Woodson & Schery 845* (MO). San Bartolomé Peninsula, *Woodson & Schery 868* (MO). DARIÉN: Tres Bocas on Río Cuasí, *Kirkbride 1361* (MO). VERAGUAS: Isla de Coiba, *Dwyer 1565* (MO).

5. **Hamelia patens**[54] Jacq., Enum. Pl. Carib. 16. 1760. TYPE: Dominican Republic, *Jacquin*, not seen.

Shrubs or small *trees*, the branchlets glabrous to sparsely villous. *Leaves* opposite or usually 3-nate or 4-nate (rarely 5-nate), elliptic, ovately elliptic or obovate elliptic, 4–18 cm long, 2.2–7.8 cm wide, deltoid to acuminate at the apex, rounded to acute at the base, the costa slender, the lateral veins 7–10, usually prominulous beneath, chartaceous to membranous, glabrous to densely villous beneath; petioles 0.5–4.0 cm long; stipules triangular to awl shaped, 2–6 mm long, villous. *Inflorescences* terminal, solitary or of a few fascicles, the flowers in dichasia, often helicoid, the flowers few to numerous, peduncle glabrate to villous, 0.4–4.0 cm long, the floral axes to 4.5 cm long; bracts triangular, less than 1 mm long, villous, deciduous. *Flowers* secund, to 2.5 cm long, sessile or subsessile, the hypanthium and calycine tube bell shaped, to 4 mm long, glabrate to villous, the lobes ovate, ca. 1 mm long, glabrate or villous, persistent; corolla orange red to red, 12–20 mm long, 2–3 mm wide, glabrous to villous outside, the lobes ovate, to 2 mm long, glabrous to villous; stamens often exserted, the anthers 8–12 mm long, the terminal appendage ca. 0.5 mm long, the filaments shorter than the anthers, attached in the upper ⅓ of the tube; style slender, about equaling the corolla tube, the stigmas oblong, about $^1/_5$ the length of the style; ovary 5-celled. *Fruits* ellipsoid or rotund, to 1 cm long, black at maturity, the ovarian disc often slightly rostrate; seeds 0.5–1.0 mm long.

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[54] For a list of synonyms see Elias (1976). Only this name has been used for Panamanian material.

Hamelia patens occurs in tropical Florida, throughout the West Indies, Mexico, Central America, and in South America south to Bolivia.

Key to varieties (adapted from Elias, 1976):

a. Leaves villous; hypanthium and calyx villous ..... 5a. var. *patens*
aa. Leaves glabrous above; hypanthium and calyx usually glabrous ..... 5b. var. *glabra*

5a. **Hamelia patens** Jacq. var. **patens.**

CANAL ZONE: Gaillard Highway, near Summit Garden, *Croat 9777* (MO). Road 2C2, Cerro Luisa, *Croat 10774* (MO). Albrook, *Dwyer 6744* (MO); *Dwyer & Hayden 4* (MO); *Dwyer & Robyns 11* (MO); *Ebinger 847* (MO). Road K2 off road to Cocoli, *Kirkbride 80* (US). Farfan Beach, *Kirkbride & Elias 72* (MO). Balboa, *Mori & Kallunki 1711* (MO). Cocolí, *Riley 133* (MO). Road K-9, *Stern et al. 308, 347* (both MO). Albrook, *Stimson 5146* (MO). Contractors Hill, *Stimson 5242* (MO). Madden Dam, *Stimson et al. 5085* (MO). Curundú, *Tyson 1073* (MO). Chiva-Chiva Trail near Miraflores Lake, *Tyson 1404* (MO). Cocolí, *Tyson 1635* (MO). Barro Colorado Island, *White 122* (MO). Miraflores Lake, *White & White 188* (MO). CHIRIQUÍ: Cerro Horqueta, ca. 7000 ft, *Blum & Dwyer 2608* (MO). Bajo Mono, Boquete, *Davidson 469* (MO). Finca Collins, Boquete, 5000 ft, *Dwyer 7037* (MO). Boquete, Cerro Horqueta, *Dwyer & Hayden 7686* (GH, MO, NY, UC, US). N of San Félix, 36.2 km by road from Interamerican Highway, *Mori & Kallunki 6012* (MO). Finca Lerida to Boquete, ca. 1300–1700 m, *Woodson et al. 1106* (MO). COCLÉ: Forest behind Club Campestre, ca. 700 m, *Duke 13263* (MO). Las Margaritas and El Valle, *Woodson et al. 1726* (MO). DARIÉN: Without other locality, *Bristan 96* (MO). HERRERA: Road between Las Minas and Pesé, ca. 600 ft, *Duke 12335* (MO). Ocú, *Ebinger 2002* (MO). 12.5 mi S of Ocú, 1200 ft, *Lewis et al. 1668* (GH, MO, UC, US). LOS SANTOS: Upper Río Pedregal, 350–400 m, *Croat 34490* (MO). Los Toretos, *Dwyer 2424* (MO). Pedasí, *Dwyer 2483* (MO). Guaybo, *Stern et al. 1903* (MO). Tonosí, *Tyson et al. 3108* (MO). PANAMÁ: Isla Pedro Gonzales, *Allen 2594* (MO). Río Congo, *Carrasquilla et al. 208* (MO). 2 mi from U. of Panama, Transisthmian Highway, *D'Arcy & D'Arcy 6108* (MO). Isla Chepillo, *Duke 10317* (MO). Tocumen, *Dwyer 1850* (MO). Lídice, *Jaramillo 1* (MO). Cerro Silvestre, *Reece 29* (MO). 5 mi N of Panama City, *Stimson 5045* (MO). Arraijan, *Woodson et al. 1367* (MO). Isla Taboga, *Woodson et al. 1436* (MO). VERAGUAS: 5 mi N of Santiago, *Blum & Tyson 607* (MO). 2–4 mi E of Santiago, *Duke 12357* (MO). Santiago, *Dwyer & Kirkbride 7419* (G, MO, US). Montijo, 8 mi S of Santiago, *Tyson 6034* (MO).

5b. **Hamelia patens** var. **glabra**[55] Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 42. 1853. TYPE: Nicaragua, *Oersted s.n.* (C, holotype, not seen).—FIG. 46.

BOCAS DEL TORO: RR track near Milla 5, *Croat & Porter 16462* (MO). Isla Bocas del Toro, *Durkee 71-150* (MO). Río Changuinola, *Dwyer 42, 2758* (both MO). Quebrada Huron, 300–400 ft, *Kirkbride & Duke 445* (MO). Changuinola to 5 mi S at junction of Ríos Changuinola and Teribe, *Lewis et al. 821* (COL, MO). Changuinola, *Lewis et al. 974* (MO, SCZ, UC). Shepherd Island, *McDaniel 5160* (MO). Isla Colón, *Wedel 96, 2483, 2930* (all MO). Water Valley, *Wedel 664, 2752* (both MO). Chiriquí Lagoon, *Wedel 1236, 2598, 2901* (all MO). Nievecita, *Woodson et al. 1850* (MO). CANAL ZONE: Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16346* (MO). Juan Mina, *Bartlett & Lasser 16514, 16531* (both MO). Fort Sherman, *Blum & Dwyer 2131* (MO). Pipeline Road near Gamboa, *Clewell & Tyson 3252* (MO). Road S-10 N of Escobal, *Croat 12436, 12461* (both MO). Farfan Beach, *D'Arcy & D'Arcy 6072* (MO). Coco Solo Weather Station, *Duke 4282* (MO). Camp Piña, *Duke 4418A* (MO). Madden Dam, Boy Scout Camp Road, *Dwyer 6928, 9163* (both MO); *Dwyer & Elias 7476* (GH, MO, US), *7483* (GH, MO), *7498* (COL, MO, UC), *7499* (MO). Madden Dam, *Dwyer & Lallathin 8835* (MO). Fort San Lorenzo, *Ebinger 459* (MO). Frijoles, *Greenman & Greenman 5156* (MO). Mandingo Road, *Hayden 61* (MO). Gatún, *Hladik 525, 538* (both MO). Below Madden Dam lookout station, *Kirkbride s.n.* (MO). Boy Scout Camp Road, Madden Dam, *Kirkbride 40, 41, 51* (all MO). Farfan Beach Road, *Kirkbride & Elias 72* (MO). Río Chagres Bridge, SE of Gamboa, *Lasseigne 4268* (MO). Pipeline Road, 16 mi N of Gamboa, *Lewis et al. 5461* (MO, SCZ).

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[55] For a list of synonyms see Elias (1976). Only this name has been applied to Panamanian material.

FIGURE 46. *Hamelia patens* var. *glabra* Oerst.—A. Habit (×½). [After *Elias 1699.*]—B. Fruiting branch (×1). [After *Elias 7498.*]

RR 3½ mi W of Gamboa, *Nee & Mori 3613* (MO). Rodman Marine Base, *Nowicke et al. 3579* (COL, MO, UC). Chiva-Chiva Trail, 2 mi N of Miraflores Locks, *Tyson 1382, 1400* (both MO). Old Fort Lorenzo, *Tyson 1539, 1551* (both MO). 5 mi NW of Cocoli, *Tyson 1622* (MO). Gatún RR Station, *Tyson 2280* (MO). 1 mi N of Summit Garden, *Tyson & Blum 1941* (MO). Farfan Beach, *Tyson et al. 3177* (MO). Miraflores, *White 115* (MO). Pipeline Road, *Witherspoon & Witherspoon 8293* (MO). Salamanca Hydrographic Station, Rio Pequeni, *Woodson et al. 1613* (MO). BARRO COLORADO ISLAND: *Aviles 11 A* (MO); *Bartlett & Lasser 16746* (MO); *Croat 4053, 4273, 4392, 6362, 6370, 6814, 6962* (all MO); *Dwyer et al. 8471* (MO); *Ebinger 36* (MO); *Hayden 39, 1039, 1040, 1041* (all MO); *Shattuck 167, 924* (MO); *Starry 76* (MO); *Tyson 4211* (MO); *Wetmore & Abbe 41, 173* (both MO); *Woodworth & Vestal 622* (MO); *Zetek 4270* (MO). CHIRIQUÍ: Puerto Armuelles, *D'Arcy 10071* (MO). Chiriquí-Veraguas boundary line, old gravel main highway, *Dwyer 2930* (MO). Boquete, 3300–4200 ft, *Lewis et al. 642* (GH, MO). COCLÉ: El Valle, road to La Mesa, *Croat 13312* (MO). Club Campestre, ca. 700 m, *Duke 13263* (MO). Cerro Pilón and El Valle, 700–900 m, *Duke & Dwyer 13898 A* (MO). El Valle, *Dwyer 1833, 10498* (both MO). El Valle, vicinity of Cerro Pilón, *Dwyer & Correa 7969* (MO, NY, UC). La Mesa, *Dwyer & Duke 8294* (MO). Cerro Pilón, *Kirkbride 1084* (MO). El Valle, *Lao 280* (MO); *Lewis et al. 1788* (COL, MO, UC, VEN). Río Grande, *Rosario 5* (MO). El Valle, *Seibert 425*

(MO). Llano Bonito, S of Las Margaritas, *Seibert 529* (MO). El Valle, *Tyson et al. 3967* (MO). Las Margaritas and El Valle, *Woodson et al. 1244* (MO). COLÓN: Río Gatuncillo, vicinity of Santa Rosa, *Allen 4160* (MO). Sardinilla, *Blum & Tyson 507, 525* (both MO). Sabanita, *Croat 11068* (MO). Portobelo, *D'Arcy & D'Arcy 6684* (MO); *Dwyer 5008* (MO). Chagres, *Gutierrez 23* (MO). 2.4 mi SW of Piña, *Lewis et al. 1852* (COL, MO, UC). 1 mi S of Gatuncillo, *Stimson 5260* (MO). Achiote, *Tyson et al. 4510* (MO). DARIÉN: Río Tuqueza below Quebrada Venado, *Bristan 1073* (MO). Río Pirre, *Croat & Porter 15522, 15453* (both MO). 2–3 mi S of El Real, *Duke 4841* (MO). Río Pirre, 2–5 mi above El Real, *Duke 5082* (MO). Cerro Pirre, S of El Real, 100–600 m, *Duke 5292* (MO). 10 mi S of El Real, Río Pirre, *Duke 5449* (MO). Between Río Membrillo and Río Yaviza, *Duke 8620* (MO). Río Piñas, *Duke 10564* (MO). Cerro Chucula, drainage Río Pavarando, *Gentry 4253* (MO). Upper Río Tuqueza, *Le Clezio 132* (MO). Río Tuquesa, Charco Chiva, *Mori 6972* (MO). Without locality, *Sexton 218* (MO). Yaviza, along Río Chucunaque, Quebrada Barbua, *Stern et al. 85* (MO). Trail El Real to Pinogana, *Stern et al. 274* (MO). Trail between Paya and Payita, *Stern et al. 354* (MO). Tucutí, Chepigana, *Terry & Terry 1406* (MO). 3 mi N of Santa Fé, *Tyson et al. 4622* (MO). LOS SANTOS: Las Tablas, *Dwyer 1157A* (MO). 17.8 mi S of Macaracas, 1100 ft, *Lewis et al. 1607* (MO, UC). PANAMÁ: Panama City, Lefevre Park, *Bartlett & Lasser 16335* (MO). Road to Cerro Campana, *Croat 12047* (MO). Río Cañita, Jenené, *Duke 3818* (MO). Río Bayano above confluence with Río Chepo, *Duke 3985* (MO). 6 mi E of Chepo, *Duke 4063, 4082* (both MO). Río Mamonica, 4 mi beyond Chepo, *Duke 5575* (MO). San José Island, between Bodega Bay and Río Mata Puerco, *Duke 12543* (MO). Piria-Cañasas Trail, *Duke 14312* (MO). Río Bayano, 1–4 mi above Piria, 100 m, *Duke 14398* (MO). Alhajuela, *Dwyer 1042, 1045* (both MO). Tocumen, *Dwyer 4065* (MO). 1 km E of El Llano, *Gentry 6467* (MO). San José Island, *Johnston 147* (MO). Transisthmian Highway and Madden Dam, *Lewis et al. 5303* (MO, SCZ, UC). Panamá, *Moran 12* (MO). 25 km NE of Cerro Azul, Río Piedras, 550 m, *Mori & Kallunki 3286* (MO). La Chorrera, *Rodriguez 14* (MO). El Llano, *Tyson 1739* (MO). SAN BLAS: Puerto Obaldía, *Croat 16959* (MO). Sasardí, *Duke 10135* (MO). Río Diablo and Río Acuatí, *Duke 14877* (MO). Ailigandí, *Dwyer 6848* (MO). Soskatupu Island, *Elias 1662* (COL, MO, UC), *1699* (MO). Headwaters of Río Mulatupo, *Elias 1755* (GH, MO, UC, US). Mainland opposite Playon Chico, *Gentry 6371* (MO). 3–4 hrs up Río Mulutupu on foot, *Kirkbride 219* (MO). VERAGUAS: Isla de Coiba, *Dwyer 1565* (MO). Tute, *Dwyer 4283* (MO). 3.9–5.0 mi N of Santa Fé, 500–1000 m, *Gentry 2952, 2999* (both MO).

6. **Hamelia rovirosae** Wernham, J. Bot. 49: 211. 1911. TYPE: México, *Rovirosa 499* (NY, US, isotypes).

H. patens var. *coronata* J. D. Smith, Bot. Gaz. 4: 4. 1905. TYPE: Guatemala, *Tuerckheim 8532* (US, holotype; F, NY, isotypes).

H. purpurascens Blake, Contr. Gray Herb. 52: 105. 1917. TYPE: British Honduras, *Peck 104* (G, holotype).

Shrubs, the branchlets villous, the hairs septate. *Leaves* ternate, occasionally opposite, elliptic to ovate, 5–16 cm long, 2–7 cm wide, acuminate, attenuate at the base, the lateral veins 3–5, arcuate, glabrous to sparsely villose above, villous beneath; petioles 0.3–2.0 cm long; stipules linear, often widely so, 5–8 mm long. *Inflorescences* terminal, dichasial or often helicoid; peduncles to 3 cm long, villous, the floral axes 1.5–3.5 cm long, each axis 3–8-flowered, the flowers secund, sessile or on pedicels 0.1–0.2 cm long. *Flowers* with the hypanthium to 4.5 mm long, villous, the calycine lobes oblong or triangular, 2.0–5.4 mm long, villous, glabrous within; corolla reddish orange to scarlet, the tube 1.8–2.2 cm long, 2–3 mm wide, villous, the lobes ovate, 1–2 mm long, acute, villous outside; anthers 10–12 mm long, the terminal appendage ovate, ca. 0.5 mm long, the filaments 7–9 mm long; ovary 5-celled. *Fruits* cylindrical, to 1.2 cm long, 0.5–0.8 cm wide, red, finally black; seeds ca. 1 mm long.

Hamelia rovirosae is found in Mexico and throughout Central America.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 192* (F).

7. **Hamelia sanguinea** Elias, Mem. New York Bot. Gard. 26(4): 116. 1976. New name for *H. pauciflora* Standley.

H. pauciflora Standley, Contr. U.S. Natl. Herb. 18: 139. 1916. TYPE: Panamá, *Pittier 3469* (US, holotype), not *H. pauciflora* Willd. (1825).

Shrubs or small *trees*, 4–7 m tall, the branchlets terete to angular, glabrous or puberulent, these usually forming numerous short branchlets. *Leaves* mostly ternately disposed, ovate, trapeziform oblong or ovate rotund, 2.0–8.5 cm long, 1.0–3.5 cm wide, attenuate at the apex, acuminate, the acumen triangular, to 1 cm long, acute, attenuate acute to cuneate at the base, the costa prominulous or grooved above, the lateral veins (3–)4–5, arcuate, membranous to subchartaceous, glabrate above, usually minutely papillate and with numerous raphides, sparsely short ciliate beneath, often only on the costa and the veins, ciliolate; petioles slender, wiry, scarcely measurable or to 3 cm long, pubescent; stipules deciduous. *Inflorescences* with dichasia 2–5(–9)-flowered, terminal on short lateral branches; peduncles 1.0–2.5 cm long, the floral axes to 5 cm long, each with up to 4 flowers, the flowers secund, those in the axils of dichasia sessile or subsessile, the others on pedicels. *Flowers* with the hypanthium oblong, to 4.5 mm long, glabrous, the raphides numerous; calycine cup obsolete, the lobes ovate, to 1.2 mm long, acute; corolla orange red to red, glabrous, the tube cylindrical to 2 cm long, ca. 0.3 cm wide, the lobes ovate, ca. 1.5 mm long or longer, pubescent outside; anthers linear, 8–10 mm long, the terminal appendage ca. 0.5 mm long. *Fruits* suborbicular, about twice as long as wide at maturity, the persistent ovarian disc rostrate; seeds to 1.2 mm long.

Hamelia sanguinea is known only from Panama.

CANAL ZONE: 1 mi above Madden Lake, *Duke 4479* (MO). Madden Dam, Boy Scout Camp Road, *Dwyer & Elias 7488* (GH, MO, UC, US), *7494* (GH, MO, US), *7514* (MO, UC), *7515* (COL, MO, UC); *Dwyer & Hayden 21* (MO); *Dwyer & Lallathin 8834* (MO). Madden Dam, *Ebinger 875* (MO). Boy Scout Road, Madden Dam, *Hayden 77* (MO). Forest of Gatún, *Hladik 512* (MO). Madden Dam Road, Boy Scout Camp Road, *Kirkbride 50* (MO). Madden Dam, *Lewis et al. 22* (MO, SCZ, UC). Trail, Río Petitpie, road Ft. Sherman from Gatún Locks (S2 or 82), *Mori & Kallunki 2679* (MO). Boy Scout Road, Madden Dam, *Porter et al. 4017* (MO, SCZ). Boy Scout Camp, Madden Lake, *Tyson 5438* (MO). Boy Scout Camp Road, Madden Dam, *Tyson & Dwyer 1201* (MO). Salamanca Hydrographic Station, Río Pequeni, *Woodson et al. 1595* (MO). DARIÉN: Quebrada Venado and Peje Swamp, headwaters of Río Tuquesa, *Bristan 1021* (MO). Near Refugio, 15–21 mi N of Santa Fé, *Duke 10265* (MO). Mortí Hydro, 260 m, *Duke 14236* (MO).

8. **Hamelia xerocarpa** Kuntze, Rev. Gen. Pl. 1: 284. 1891. TYPE: Costa Rica, *Kuntze 20281* (NY, holotype).

H. magniloba Wernham, J. Bot. 49: 209. 1911. TYPE: Nicaragua, *Tate 200* (K, holotype, not seen).
H. rowleei Standley, J. Wash. Acad. Sci. 15: 7. 1925. TYPE: Costa Rica, *Rowlee & Stork 75* (US, holotype).
H. haughtii Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 116. 1940. TYPE: Colombia, *Haught 2176* (F).

Shrubs or small *trees*, the branchlets ultimately angular, scarcely lenticellate, villous. *Leaves* ovate to elliptic, 8–37 cm long, 4–14 cm wide, acuminate, attenuate to rounded at the base, the lateral veins 11–18, chartaceous, pilose above, sericeous along the veins, especially in the axils; petioles 0.8–7.0(–8.5) cm long, villous; stipules triangular, 7–17 mm long, cuspidate, often with 2 reduced lateral

teeth, glabrate. *Inflorescences* terminal, of dichasia or scorpioid cymes; peduncles 1.5–5.5 cm long, villous, the floral axes to 15 cm long, ascending, often ferrugineous pilose, the flowers secund, ca. 25 on each axis, pedicels to 0.2 cm long. *Flowers* with the hypanthium 3–4 mm long, glabrous to spreading pilose; calycine lobes ovate, 1–2 mm long, glabrous to pilose; corolla yellow salverform, to 3.5 cm long, the tube 0.4–0.7 cm wide, glabrous to densely puberulent, the lobes ovate, 4–8 mm long, acute; anthers 10–16 mm long, acute, the connective extended for ca. 0.1 mm at the apex, acute, sagittate at the base, the filaments 8–15 mm long; ovary 5-loculate, the style ca. 20 mm long, the stigmas 5, to 5 mm long.

Hamelia xerocarpa is known from Costa Rica, Panama, and Colombia.

BOCAS DEL TORO: Changuinola Valley, Lincoln Creek, *Dunlap 572* (F). Fish Creek lowlands, *Wedel 151* (F, MO). Carretera, *Wedel 648 A* (MO). Water Valley, *Wedel 742* (F, MO). Chiriquí Lagoon, *Wedel 1171* (F, MO). Old Bank Island, *Wedel 2024* (MO, US). Fish Creek lowlands, *Wedel 2381* (F, MO). DARIÉN: Río Tuquesa, Middle Tuquesa Mining Co. Camp called Charco Peje, *Mori 7086* (MO). Punta Guayabo Grande and Punta Guayabo Chiquita, *Stern & Chambers 177* (MO, NY). VERAGUAS: NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, 450–550 m, *Mori et al. 3828* (MO).

45. HEMIDIODIA

Hemidiodia Schum. in Mart., Fl. Bras. 6(6): 29. 1888. TYPE: *Spermacoce ocimifolia* Willd. = *Hemidiodia ocimifolia* (Willd.) Schum.

Perennial *herbs*, often woody and profusely branching from the base. *Leaves* narrow, the veins conspicuous; stipules adnate to the petioles, forming a setiferous sheath. *Inflorescences* axillary, epedunculate, the flowers fasciculate. *Flowers* with the calycine lobes 4; corolla funnelform, the lobes 4, valvate; stamens attached near the mouth, exserted. *Fruits* of 2 mericarps separating at maturity from a median septum, opening basally.

Hemidiodia consists of a single species which extends from Mexico to South America. It also occurs in the West Indies and in Malaya.

Literature:

Bremekamp, C. 1934. *Diodia* (Gronov.) L. in Notes on the Rubiaceae of Surinam. Rec. Bot. Neerl. 31: 305.

1. **Hemidiodia ocimifolia** (Willd.) Schum. in Mart., Fl. Bras. 6(6): 29. 1888.—FIG. 47.

Spermacoce ocimifolia Willd. ex R. & S. Syst. Veg. 3: 530. 1818. TYPE: not seen.

Subshrubs to 1 m tall, often branching from the base, the stems usually angular, smooth, puberulent or glabrous, the bark thin, often exfoliating, the nodes well spaced. *Leaves* narrowly lanceolate, ovate lanceolate to trapeziform lanceolate, to 6.5(–7.5) cm long, to 1.3 cm wide, acute at the apex, usually attenuate acute at the base, the costa prominulous to plane, the lateral veins ca. 7, strongly arcuate, chartaceous, puberulent or farinose puberulent above and beneath, the petioles almost absent or 0.3–1.0 cm long, ca. 0.25 mm wide; stipules adnate to

FIGURE 47. *Hemidiodia ocimifolia* (Willd.) Schum.—A. Habit (×½).—B. Flower (×6).—C. Fruits (×5). [After *McDaniel 6875.*]

the petioles, the body fan shaped, 2–5 mm long, membranous, turgid, puberulent, with 8–12 erect or spreading setas. *Inflorescences* disposed as sessile heads in the leaf axils, to 0.6 cm long. *Flowers* with the hypanthium oblong, ca. 1.5 mm long, petaloid, glabrous, the calycine teeth 4, scarcely visible or as triangular

points, to 0.15 mm long, glabrescent; corolla with the tube short cylindrical, ca. 1.3 mm long, petaloid, glabrous, the lobes 3–4, ca. equal to the tube or much shorter, oblong, obtuse, glabrous outside; stamens 3–4, the anthers oblong rotund, ca. 0.2 mm long, the filaments shorter than or as long as the corolla lobes, attached at the mouth; stigmas compressed rotund, ca. 0.15 mm wide, the style ca. 1.3 mm long, the septum of the ovary thin. *Fruits* oblong, 3–4 mm long, bicarpellate, each carpel 1-seeded, separating from a median septum, dehiscing at the base, densely pubescent, the calycine lobes persistent, to 0.2 mm long.

The species ranges from Mexico to Brasil.

Stern et al. 241 list the common name "Yerba Meona" and indicate that the leaves are "used for kidney and urinary disorders, boiled as a tea."

BOCAS DEL TORO: Station Milla 7.5 on Changuinola-Almirante Railroad, *Croat 38095* (MO). Changuinola River, 10–15 mi inland, *Lewis et al. 887* (G, H, K, MO, NY, UC, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2075* (MO, SCZ, UC). CANAL ZONE: S-5 Road, Caribbean side, *Blum 1505* (MO). Barro Colorado Island, *Croat 12549, 12840* (both MO). Pipeline Road within 5 mi of Gamboa Gate, *D'Arcy 9274* (MO). Hill C6, Fort Sherman, *Duke 4354, 4374* (both MO). Pipeline Road, 16 mi N of Gamboa, *Lewis et al. 5464* (MO). Navy reservation, N of Gamboa, *Robyns 69-50* (MO). COCLÉ: El Copé, *Burch et al. 1374* (COL, MO, UC). Cerro Pilón, *Duke 10275* (MO); *Dwyer et al. 4538* (MO, SCZ, UC), *4563* (MO). PANAMÁ: Cerro Azul, *Croat 11568* (MO). Cerro Campana, *Croat 12048* (MO). Cerro Jefe, *D'Arcy 3967* (MO). Cerro Campana, *Duke 5996* (MO). Cerro Azul, *Duke 9352* (MO). Río Pacora, *Duke 12016* (MO). Cerro Campana, *Dwyer & Kirkbride 7822* (MO). Chagres, *Fendler 145* (MO). Cerro Jefe, *Folsom et al. 2533* (MO). Río Pasiga, *Gentry 2362* (MO). Cerro Jefe, *Gentry 6755* (MO); *Kirkbride & Crebbs 8* (MO). Cerro Azul, *Lewis et al. 228* (F, GH, K, MO, NY, UC, US). Cerro Campana, *McDaniel 6875* (MO). Road to Altos de Pacora, *Mori & Kallunki 2351* (MO). TV tower, Cerro Peñón, 3 km S of Alcalde Diaz, *Nee 8591* (MO). Cerro Campana, *Porter et al. 4183, 4289* (both MO), *4890* (MO, SCZ). Cerro Azul, *Tyson 2082* (MO). Cerro Jefe, *Tyson et al. 4309* (MO). Macapale Island, Madden Lake, *Tyson 5484* (MO). W of El Llano, *Tyson 6876* (MO). Arraijan, *Woodson et al. 1396* (MO). SAN BLAS: Ailigandí, mainland, *Lewis et al. 67, 83* (both MO). VERAGUAS: Ustupo, *D'Arcy 9518* (MO). Road from Santa Fé past Agricultural School to base of Cerro Tute, *Folsom 1576* (MO). 3.9–5.0 mi N of Santa Fé, *Gentry 2975A* (MO).

46. HILLIA

Hillia Jacq., Enum. Pl. Carib. 3, 18. 1760. TYPE: *H. parasitica* Jacq.

Fereira Vell. ex Vand., Fl. Lusit. Bras. Sp. 21. 1788. TYPE: *F. vellozoana* J. A. & J. H. Schultes.
Saldanha Vell., Fl. Flum. 141. 1825, Not Bureau 1868. LECTOTYPE: *S. illustris* Vell.

Shrubs, mostly epiphytic, glabrous. *Leaves* succulent, drying coriaceous, petiolate; stipules thin, caducous. *Flowers* often large, solitary, terminal; hypanthium obovoid or cylindrical, the calycine cup absent, the lobes 2–5 or absent, caducous or persistent in fruit; corolla salverform or funnel shaped, the tube elongate, expanded toward the mouth, glabrous, the lobes 3–7, contorted in bud; stamens included; ovary 2-celled, the ovules numerous. *Fruits* capsular, narrowly oblong, or cylindrical, the 2 valves dehiscing septicidally; seeds imbricate, basally appendaged, bearing a distal tuft of hairs.

Hillia, a genus of about 20 species, occurs in the West Indies, Mexico, Central America, and South America.

a. Leaves small, 0.6–1.3 cm long.
   b. Leaves ca. 0.7 cm long, rounded at the apex; corolla tube ca. 1.5 cm long ..... 1. *H. chiapensis*
   bb. Leaves 0.6–1.3 cm long, tapering toward the apex; corolla tube to 2.8 cm long ..... 5. *H. panamensis*

aa. Leaves large, 2–8 cm long.
c. Leaves 2–3 times longer than wide; calycine lobes ca. 1.7 cm long ..... 3. *H. ligulifolia*
cc. Leaves less than twice as long as wide; calycine lobes less than 1 cm long or absent.
d. Corolla tube 2–3 cm long ..... 4. *H. palmana*
dd. Corolla tube 4–7 cm long.
e. Trees to 5 m tall; leaves 0.6–2.8 cm wide, rounded at the apex, drying tan beneath; corolla tube 6–7 cm long ..... 2. *H. chiriquiensis*
ee. Epiphytic shrubs to 2 m tall; leaves to 4 cm wide, usually deltoid at the apex, drying black brown beneath; corolla tube 4–5 cm long ..... 6. *H. tetrandra*

1. **Hillia chiapensis** Standley, J. Wash. Acad. Sci. 16: 16. 1926. TYPE: México, *Purpus 262* (US, holotype).

1a. **Hillia chiapensis** Standley var. **chiapensis**.

Epiphytic *shrubs*, much branched, heathlike in habit, the branches rough, 4-angled, the angles delicately alate, glabrous, the nodes constricted, the point of petiole insertion depressed and with an annular orifice. *Leaves* ericoid, elliptic, oblong elliptic or oval, to 0.7(–0.9) cm long, rounded at the apex, acute to obtuse at the base, the costa and lateral veins not visible in dried material, coriaceous, glabrous, marcescent; petioles to 0.2 cm long; stipules deciduous, occasionally persistent at tip of branchlets, obovate to oblong, 3–4 mm long, rounded, glabrous, venose. *Flowers* solitary, sessile; corolla tube ca. 15 mm long, the lobes ca. 7 mm long. *Fruits* capsular, to 3 cm long.

Hillia chiapensis ranges from Mexico to Panama.

PANAMÁ: Finca El Indio, Cerro Jefe, *Correa et al. 1770* (MO). Summit of Cerro Jefe and forests along road beyond summit, to 2700 ft, *Hayden 1021* (COL, DS, MO, UC).

1b. **Hillia chiapensis** subsp. **grandifolia** Dwyer,[56] TYPE: Panamá, *Nee 9698* (MO, holotype).

Leaves to 3(–4.5) cm long, to 1.2(–1.8) cm wide; fruits to 4 cm long.

The new subspecies is known only from Panama. It differs from *H. chiapensis* subsp. *chiapensis* in having much wider leaves and more elongate fruit.

VERAGUAS: Lower montane wet forest 6–7 km W of Santa Fé on new road past agricultural school, 2900 ft, *Nee 9698* (MO).

2. **Hillia chiriquiensis** Dwyer.[57] TYPE: Panamá, *Mori & Kallunki 5810* (MO, holotype).—FIG. 48.

Trees to 5 m tall, branching freely, ericoid in appearance, ultimately black when dry, the branchlets thick, the nodes well spaced or crowded, ultimately

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[56] *Hillia chiapensis* subsp. *grandifolia* Dwyer, subsp. nov. *Folia* ad 3(–4.5) cm longa, ad 1.2(–1.8) cm lata; fructus ad 4 cm longi.

[57] *Hillia chiriquiensis* Dwyer, spec. nov. *Arbores* ad 5 m altae ramulis ericoideis. *Folia* angusto-obovata vel oblonga, 2.0–6.5 cm longa, 0.6–2.8 cm lata, apice rotundata venis lateralibus ca. 4 arcuatis plerumque invisibilibus, coriacea glabra; petiolis ad 0.8 cm longis; stipulis terminalibus, ad 1.5 cm longis. *Flores* terminales solitarii, lobis calycis 4 oblongis, ca. 0.4 cm longis, ca. 0.8 cm latis; corolla viridi, tubo infundibuliformi, ad 7 cm longo, 0.3 cm lato, lobis 4–5, antheris subsessilibus, ca. 1.2 cm longis, apice connectivo ad 1 mm producto. *Fructus* non visi.

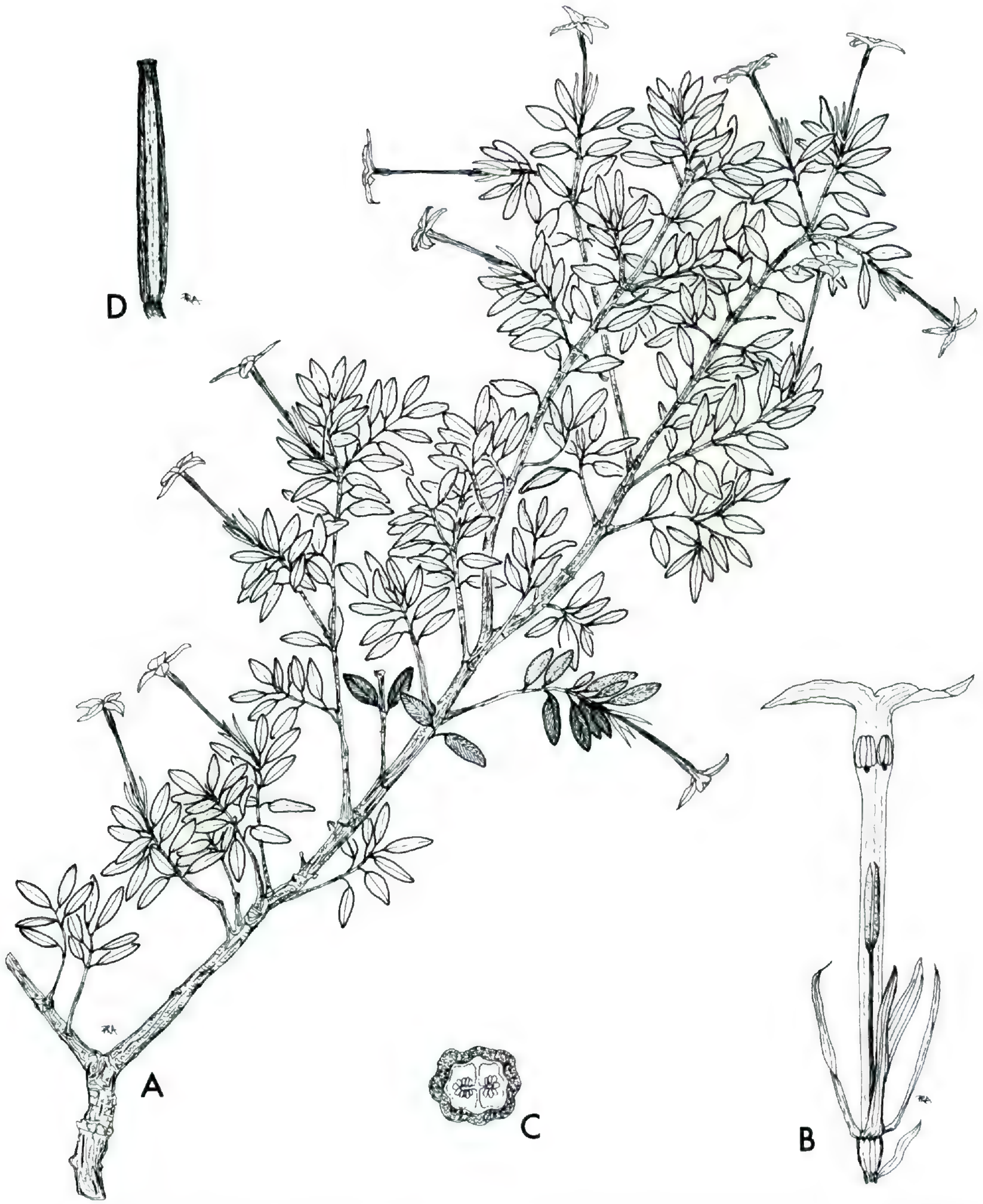

FIGURE 48. *Hillia*. A–C. H. *chiriquiensis* Dwyer.—A. Habit (×½).—B. Flower, opened to show interior (×3).—C. Ovary cross section (×11.5). [After *Mori & Kallunki 5810.*]—D. *H. tetrandra* Swartz. Fruit (×.6). [After *Dwyer & Gauger 7377.*]

angular, nodose in appearance. *Leaves* crowded at the apex of the twigs, narrowly obovate oblong, 2.0–6.5 cm long, 0.6–2.8 cm wide, rounded at the apex, acute or cuneate toward the base, the costa scarcely prominulous above, only visible on the proximal side of the blade, the lateral veins ca. 4, inconspicuous, at times invisible above, arcuate, the margin lightly revolute, coriaceous, discolorous, smooth, drying tan beneath, glabrous; petioles to 0.8 cm long, thick, to 0.25 cm wide; stipules deciduous, persistent only at the tips of the twigs, oblong,

to 1.5 cm long, obtuse, coriaceous, glabrous. *Flowers* terminal, solitary, calycine lobes 4, oblong, 4–6 mm long, 2–4 mm wide, obtuse, coriaceous, glabrous; corolla green, the tube infundibuliform, 6–7 cm long, to 0.3 cm wide, dilated toward the apex, the lobes 4–5, white with a pink tinge, ovate oblong or oblong, to 2.5 cm long, to 1.3 cm wide, obtuse, glabrous; stamens 4–5, the anthers subsessile, oblong, ca. 1.2 cm long, the acumen to 1 mm long, sagittate at the base, attached about 1.5 cm below the mouth; style linear, to 5.5 cm long, ca. 0.1 cm wide, lignose when dry, glabrous. *Fruits* not seen.

Hillia chiriquiensis is known only from Panama. It is remarkable in being a fair-sized tree and in having the longest corolla among the Panamanian *Hillia*.

CHIRIQUÍ: N of San Félix, Chiriquí-Bocas del Toro border, on Cerro Colorado Copper Mine Road, lower montane rain forest, 5000–5500 ft, *Mori & Kallunki 5810* (MO).

3. **Hillia ligulifolia** Dwyer.[58] TYPE: Panamá, *Nee 9812* (MO, holotype).

Epiphytic *trees*, 3.5–5 m tall, the branchlets numerous, glabrous, drying dark, tending to be opposite and arcuate, ultimately quadrangular, the nodes well spaced below, crowded at the tips of the twigs. *Leaves* narrowly oblong or vaguely obovate oblong, to 8 cm long, 1.5–2.5 cm long, the blades usually 2½ times longer than wide, conspicuously rounded or truncate at the apex, basally cuneate to attenuate acute, the costa thick and prominulous proximally, evanescent distally, the lateral veins 4–5, inconspicuous, scarcely prominulous, strongly ascending, coriaceous, concolorous, drying dark brown, glabrous; petioles variable in length and thickness, 0.1–1.5 cm long, the thicker petioles short, the blades decurrent; stipules deciduous, often persisting at the tips of the twigs, of the same shape and texture as the leaves, to 2 cm long. *Flowers* solitary, terminal, sessile, the hypanthium enclosed by 2 bracts (stipules?) and by 4 bracteoles of the same texture as the leaf blades, to 2 cm long; bracts connate, each part with 2 subrotund lobes, to 0.6 cm long; bracteoles 4; calycine lobes 4, narrowly oblong, 1.0–1.4 cm long, 0.2–0.3 cm wide, unequal, coriaceous, glabrous; corolla tube ca. 4 cm long, the lobes 1 cm long, white, the lateral margins tinged with red; stamens 5, the anthers narrowly oblong, ca. 12 mm long, the connective produced at the apex; style slender, to 5.5 cm long, the stigmas oblong, ca. 5.5 mm long, ca. 2.5 mm wide. *Fruits* sessile, narrowly oblong, cigar shaped, often somewhat falcate, (3.5–)5–6 cm long, to 1 cm wide before dehiscence, rounded at the apex, obtuse at the base, drying deep red, glabrous, the calyx often persistent, the lobes to 1.8 cm long, to 0.6 cm wide, rounded at the apex, venose.

Hillia ligulifolia is known only from Panama. It is distinguished from other *Hillia* of Panama by its very large calycine lobes and its leaves, many of which

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[58] *Hillia ligulifolia* Dwyer, spec. nov. *Arbores*. *Folia* angusto-oblonga vel vix obovato-oblonga, saepe liguliformia, ad 8 cm longa, 1.5–2.5 cm lata, apice rotunda vel truncata, basim versus cuneata ad attenuato-acuta, venis lateralibus 4–5 inconspicuis, coriacea; petiolis 0.1–1.5 cm longis; stipulis foliis similibus, ad 2 cm longis. *Flores* solitarii terminales sessiles; lobis calycis angusto-oblongis, 1.0–1.4 cm longis, 0.2–0.3 cm latis; corolla tubo 4 cm longo, lobis 1 cm longis; antheris angusto-oblongis; stylo ad 5.5 cm longo, stigmatibus ca. 5.5 mm longis, ca. 2.5 mm latis. *Fructus* sessiles, angusto-oblongi, saepe falcati, (3.5–)5–6 cm longi, ad 1 cm lati, obtusi basi, apice rotundati; lobis calycis persistentibus ad 1.8 cm longis, ad 0.6 cm latis.

are truncate at the apex. Many of the leaf blades have a tonguelike or straplike shape. Noteworthy is the fact that the petioles are quite variable in length and thickness. The persistent calycine lobes give the large fruits a striking appearance. Only one other Panamanian large-leafed *Hillia* is known in the fruiting stage: *H. tetrandra*.

CHIRIQUÍ: Cerro Colorado, 34.1 km beyond bridge over Río San Félix, 1390 m, *Croat 37199, 37256* (both MO). Cerro Colorado, 35.6 km from Río San Félix bridge, 1390 m, *Sullivan 388* (MO). PANAMÁ: Cerro Jefe, ca. 1000 m, *Mori & Joly 7926* (MO). VERAGUAS: Lower montane wet forest 6–7 km W of Santa Fé on new road past agriculture school, 2900 ft, *Nee 9812* (MO).

4. **Hillia palmana** Standley, J. Wash. Acad. Sci. 18(6): 164. 1928. TYPE: Costa Rica, *Maxon & Harvey 8045* (US, holotype).

Epiphytic *shrubs*, the branchlets terete, finally compressed, black when dry and covered with gray spots, glabrous. *Leaves* persisting toward the apex of the branchlets, obovate or obovate rotund, 1.5–4.5 cm long, 1.0–2.2 cm wide, round or truncate at the apex, cuneate basally, the costa scarcely distinguishable, the lateral veins not visible, thickly coriaceous, concolorous, glabrous, the margin slenderly callose; petioles thick, to 1 cm long, to 0.3 cm wide; stipules deciduous, persistent toward the apex, obovate rotund, to 1.5 cm long, rounded, coriaceous, glabrous, the veins conspicuous or evanescent. *Flowers* terminal, solitary, to 4 cm long, enclosed partially by 2 large bracteoles, these compressed rotund, to 2 cm long, scarious, glabrous, venose; hypanthium rectangular, to 1.8 mm long, glabrous, the calycine cup none, the lobes obviously absent; corolla white, the tube infundibuliform, 2–3 cm long, ca. 0.3 cm wide, rigid, glabrous, the lobes 4, compressed rotund, to 1 cm long, wider than long, glabrous; stamens subsessile, the anthers linear oblong, ca. 3 mm long, affixed near the mouth; style ca. 6 mm long, the stigmas 2, subulate, ca. 3 mm long. *Fruits* not seen.

Hillia palmana is known only from Costa Rica and Panama. The leaves are strikingly ligulate. As few flowers are available for dissection I elected to dissect one whose corolla measured only 2 cm in length. No ovules were located; this coupled with the absence of fruit in the two known collections is cause for speculating that the flowers are unisexual. In this dissection the style and stigmas measured only about ½ the length of the corolla tube.

VERAGUAS: NW of Santa Fé, 1 km from Escuela Agricola Alto de Piedras, *Mori & Kallunki 4873* (MO).

5. **Hillia panamensis** Standley, N. Am. Fl. 32(2): 117. 1921. TYPE: Panamá, *Pittier 3190* (US, holotype).

H. hathewayi Fosberg, Sida 2: 387. 1966. TYPE: Costa Rica, *Hatheway 1371* (US, holotype).

Epiphytic *trees*, to 4 m tall, the branchlets ericoid in habit, ultimately bearing very short and numerous branchlets, the nodes proximate, the leaves tending to persist only at the tips of the twiglets. *Leaves* elliptic oblong, 0.6–1.2 cm long, 0.4–0.5 cm wide, tapering slightly toward the apex, subacute to obtuse at the base, frequently cuneate, the costa and lateral veins invisible above, scarcely visible beneath, the lateral veins ca. 2, strongly arcuate ascending, subcoriaceous,

concolorous, drying dark, glabrous; petioles absent or to 0.2 cm long; stipules (Standley) narrowly oblong, to 4 mm long, obtuse, brownish. *Flowers* terminal, solitary; hypanthium narrowly oblong or turbinate, ca. 2 mm long, glabrous, the calycine lobes 4, linear oblong, to 9 mm long, ca. 0.8 mm wide, obtuse, glabrous, drying red, venose; corolla white, the tube narrowly cylindrical, to 2.8 cm long, ca. 0.8 cm wide in the middle, glabrous inside and out, the lobes 4, ovate triangular, to 1.2 cm long, obtuse, glabrous, petaloid, venose; stamens 4, the anthers subsessile, affixed immediately below the mouth, oblong, ca. 1.8 mm long, obtuse, the style linear, ca. 12 mm long, the stigmas 2, ca. 3 mm long, scarcely wider than the style. *Fruits* linear oblong, 1.0–2.5 cm long; seeds oblong with terminal hairs to 6 mm long.

CHIRIQUÍ: Cerro Horqueta, 1650 m, *Croat 26957* (MO); *Pittier 3190* (US).

6. **Hillia tetrandra** Swartz, Prodr. 58. 1788. TYPE: Jamaica, *Swartz* (not seen).

H. maxonii Standley, J. Wash. Acad. Sci. 18: 163. 1928. TYPE: Nicaragua, *Maxon 7501* (US, holotype).

Small *shrubs*, to 2 m tall, often epiphytic, the twiglets terete or angular, smooth, glabrous, the nodes well spaced. *Leaves* oblong rotund or ovate oblong, mostly equilateral, to 7 cm long, to 4 cm wide, usually deltoid, occasionally obtuse at the apex, obtuse, rounded or cuneate at the base, the costa plane proximally above, subprominulous proximally beneath, evanescent distally, the lateral veins ca. 5, arcuate, evanescent above and beneath, coriaceous, drying dark brown; petioles to 1 cm long, to 0.25 cm wide, shiny, puberulent to glabrescent, the lamina decurrent on the upper side; stipules oblong, to 1.5 cm long, tapering, obtuse, coriaceous, glabrous. *Flowers* terminal, solitary, subsessile; hypanthium oblong, ca. 10 mm long, ca. 3.5 mm wide, glabrous, the lobes 5, often deciduous, 0.5–1.0 cm long or perhaps scarcely measurable; corolla white or yellow with the tube narrowly cylindrical, 4–5 cm long, 0.2–0.4 cm wide, often subfalcate, glabrous inside and out, the lobes 5, oblong, ca. 1.5 cm long, ca. 1.2 cm wide, glabrous; stamens 5, the anthers oblong, ca. 11 mm long, 2 mm wide, obtuse, the filaments short, ca. 1 mm long; style linear, ca. 5.5 cm long, ca. 0.9 mm wide, the stigmas about as wide as the style, to 12 mm long, villose. *Fruits* sessile, narrowly oblong, 5(–7) cm long, 0.4–0.9 cm wide, truncate or rounded, smooth, glabrous, lignose; seed ca. 2 mm long with a tuft of tawny hairs to 12 mm long.

Hillia tetrandra occurs in the West Indies and throughout most of Central America.

One collection, *Maxon & Harvey 8092* (US), has calycine lobes to 4 mm long; these are obtuse at the apex. In other respects it resembles the Panamanian material of *Hillia tetrandra*. *Mori & Kallunki 5815* notes, "flower not opened when collected at 5:00 p.m. but opened in bag by 7:00 p.m. Moth pollinated?"

CHIRIQUÍ: San Félix, *Maxon & Harvey 8092* (US). N of San Félix at Chiriqui-Bocas del Toro border, Cerro Colorado Copper Mine Road, 5000–5500 ft, *Mori & Kallunki 5815* (MO). COCLÉ: Cerro Valle Chiquito, *Seibert 495* (MO). COLÓN: Santa Rita Ridge, *Dwyer & Gentry 9394* (MO). PANAMÁ: Cerro Campana, *Allen 1872* (F); *Croat 14801* (MO). Goofy Lake, road to Cerro Jefe, *Correa & Dressler 941* (MO). Cerro Campana, *Dressler 3522* (MO). Cerro Jefe, *Dwyer & Gauger 7377* (MO); *Mori & Kallunki 6095* (MO). VERAGUAS: 5 mi W of Santa Fé, *Croat 23079* (MO).

47. HIPPOTIS

Hippotis Ruiz & Pavón, Prodr. Fl. Peruv. 33. 1794. TYPE: *H. trifolia* Ruiz & Pavón.

Shrubs or trees. *Leaves* with the blades membranous or thinly chartaceous, the intervenal areas lineolate, petiolate, the stipules large, caducous. *Inflorescences* cymose (or flowers occasionally solitary). *Flowers* large, 5-merous, tending to become zygomorphic, the calyx large, spathaceous or bilabiate; corolla tubular or funnelform, usually curved, the lobes short, plicate valvate; stamens often unequal in length, inserted near the middle of the tube; style slender, elongate, the ovary 2-celled, the ovules numerous, the placentas adnate peltately to the septum. *Fruits* baccate, round; seeds numerous, foveolate.

Hippotis, a genus of about a dozen species, is known from Panama, Colombia, Venezuela, Ecuador, and Peru.

1. **Hippotis albiflora** Karst., Fl. Colomb. 1: 33. 1858. TYPE: not seen.—FIG. 49.

Duroia panamensis Dwyer, Ann. Missouri Bot. Gard. 55: 38. 1968. TYPE: Panamá, *Kirkbride & Duke 571* (MO, holotype).

Trees to 8 m tall, the branchlets subterete, drying lightly rimose, densely pilose terminally, nodose. *Leaves* obovate elliptic, to 26 cm long, to 15 cm wide, widely deltoid at the apex, acuminate, the acumen to 1.5 cm long, the costa prominulous above, prominent and convex beneath, the lateral veins ca. 12, at first strict, then slightly arcuate toward the margin, 2.0–2.5 cm apart in larger blades, prominent beneath, the secondary veins irregularly pinnatiform, the ultimate veins enclosing minute, parallel striae, the hairs appressed, white, ca. 1–2 mm apart, somewhat scabrous, pilose beneath, with some hairs more rigid and longer, ciliolate; petioles 1.0–2.5 cm long, lignose, pilose; stipules free, deciduous, ovate elliptic, here the younger ones to 1.5 cm long, densely pilose. *Flowers* 1(?–3), terminal or axillary; hypanthium oblong, 8–10 mm long, densely appressed pilose, the hairs yellowish white, ascending, 4–5 mm long, the calycine cup tubular for 10 mm then spathaceous for ca. 15 mm, thickly petaloid, densely villose outside, the hairs stiff, white, to 2.5 mm long, glabrous and eglandular within; corolla white or greenish white, curved, trumpet shaped, to 45 mm long, ca. 6 mm wide in the middle, densely white pilose outside, glabrous within, stiffly petaloid or subcoriaceous, the lobes 5, elliptic or ovate, ca. 1 cm long, ca. 0.8 cm wide, densely white pilose outside; stamens 5, included, the filaments slightly unequal, to 11.5 mm long and to 0.8 mm wide, plane, densely pilose, attached below or near middle of the tube, the anthers oblong, ca. 3 mm long; ovarian disc oblong rotund, to 3 mm long, the style elongate, subplane, ca. 1 mm wide, the stigmas not seen. *Fruits* nutlike, elliptic, to 3 cm long, to 1.5 cm wide, often 5–7-ribbed, densely pilose, the hairs yellowish white, the calyx persistent, about as long as the fruit; seeds elliptic oblong, ca. 2 mm long, 3-angled, foveolate under magnification.

Hippotis albiflora occurs in Costa Rica, Panama and Colombia. *Kirkbride & Duke 571* notes the: "corolla tube greenish white, anthers yellow." *McDaniel 5079* notes that the plant is a "vine" but this is highly unlikely.

FIGURE 49. *Hippotis albiflora* Karst. Habit (×½). [After *Kirkbride & Duke 571.*]

COSTA RICA: HEREDIA: Puerto Viejo, Sarapiqui, 10°26′N, 84°01′W, Finca La Selva, *Harkhorn 1044* (MO). PANAMÁ: BOCAS DEL TORO: Duwebdulup Peak, N of Río Teribe, across from West Huron, *Kirkbride & Duke 571* (MO). 4 mi N of Almirante, *McDaniel 5079* (MO). COLOMBIA: CHOCO: Rain forest NW of Alto Curiche, ca. 300 m, *Duke & Idrobo 11258* (MO). SANTANDER: Magdalena Valley, Campo Capote, 30 km E of Carare, 300 m, *Gentry et al. 20083* (MO).

48. HOFFMANNIA

Hoffmannia Swartz, Prodr. Fl. Ind. Occ. 30. 1788. TYPE: *H. pedunculata* Swartz.

O'Higginsia Ruiz & Pavón, Fl. Peru 1: 55. 1798. TYPE: *O. obovata* R. & P.
Higginsia Pers., Syn. Pl. 1: 133. 1805. LECTOTYPE: *H. obovata* Pers., "Higginsia" orth. mut. Steudel Nom. ed. 2, 1: 767. 1840.
Evosmia caripensis H. & B., Pl. Aeq. 2: 165. 1817. TYPE: *E. caripensis* H. & B.
Campylobotrys Lem., Fl. Serres Jard. Eur. 3: 269. 1847. TYPE: *C. discolor* Lem.

Shrubs, subshrubs or small trees, rarely herbs. *Leaves* membranous to thickly chartaceous, usually replete with cystoliths, petiolate or sessile, the stipules deciduous. *Inflorescences* axillary, occasionally subtended by roots (rhizomatous), cymose, usually pedunculate, the flowers spreading or conglomerate. *Flowers* usually pedicellate, the hypanthium with numerous cystoliths, the calycine tube short, the teeth often 4, usually shorter than the hypanthium; corolla tube usually reduced, glabrous within, the lobes imbricate; stamens 3–5, the anther connective occasionally produced apically; style elongate, slender, glabrous, the stigmas

usually 2, if connate then clavate, linear or lanceolate. *Fruits* baccate, usually 2-celled; seeds numerous, small, foveolate.

Hoffmannia ranges from Mexico to Argentina. There are more than 150 species in the genus, ½ of which may be reduced to synonomy when a monograph of the genus is written. This is the most challenging among the larger genera of Rubiaceae in Middle America. The fact that the stipules drop off when the leaf buds emerge contributes to the taxonomic difficulty of the genus. The flowers and fruits exhibit little variability for the size of the genus.

Literature:

Dwyer, J. D. 1969. The Genus *Hoffmannia* (Rubiaceae) in Panama. Annals of the Missouri Botanical Garden 56: 269–286.

Standley, P. C. 1934a. North American Flora. Rubiales—(Pars) 32: 190–208.

Williams, L. 1973. *Hoffmannias* from Mexico and Central America. Fieldiana (Botany) 36(6): 51–60.

1. Leaves bullate.
   2. Leaves with lateral veins 22–25 ..... 22. *H. pustulata*
   2′. Leaves with lateral veins 8–14 ..... 4. *H. bullata*
1′. Leaves smooth, not bullate.
   3. Petioles with conspicuous lateral inflations (vescicles).
      4. Inflorescences axillary and occasionally terminal; inflations of petioles, if present, poorly developed; lateral veins of leaves ca. 10 ..... 18. *H. morii*
      4′. Inflorescences strictly axillary; inflations of petioles well defined; lateral veins of leaves 11–25.
         5. Leaf blades to 25 cm long; petioles to 4 cm long; fruits red ..... 26. *H. vesciculifera*
         5′. Leaf blades to 40 cm long; petioles to 13 cm long; fruits white ..... 12. *H. kirkbridei*
   3′. Petioles without conspicuous lateral inflations.
      6. Leaves petiolate.
         7. Hypanthium with hairs to 1.7 mm long; inflorescence usually contracted and peduncle short.
            8. Inflorescences densely capitate and fasciculate, the peduncle much reduced or absent, flowers not unilaterally or helicoidally disposed.
               9. Small trees; petioles 0.5–0.8 cm long; stigmas clavate ..... 1. *H. aeruginosa*
               9′. Herbs; petioles 1–4 cm long; stigmas linear oblong ..... 3. *H. areolata*
            8′. Inflorescences patulous, the peduncle to 1.5 cm long, flowers unilaterally and helicoidally disposed ..... 10. *H. gentryi*
         7′. Hypanthium with hairs less than 1 mm long or absent; inflorescences usually pedunculate and spreading.
            10. Fruits (immature) at least 2 times longer than wide; stigmas linear oblong, spreading, ca. ⅓ the length of the style.
               11. Peduncles absent or to 1 cm long; plants terrestrial, 1.5–2.5 m tall.
                  12. Leaves chartaceous, the lateral veins ca. 4; peduncles to 10 mm long ..... 23. *H. rexmontis*
                  12′. Leaves membranous; lateral veins 10–11; peduncles padlike and scarcely measurable, occasionally to 8 mm long ..... 21. *H. psychotriifolia*
               11′. Peduncles to 4.5 cm long; plants probably epiphytic, ca. 0.25 m tall ..... 4. *H. bullata*
            10′. Fruits less than 2 times longer than wide; stigmas if linear oblong, very short and spreading.
               13. Corolla lobes 2 or more times longer than the tube; leaf blades often with patches of raphides on upper surface forming a thin crust ..... 14. *H. lenticellata*
               13′. Corolla lobes less than 2 times the length of the tube; leaf blades lacking patches of raphides forming a crust.
                  14. Calycine lobes to 12 mm in fruit; seeds visible through the wall of the fruit ..... 16. *H. longicalycina*
                  14′. Calycine lobes 1–3 mm long; seeds not visible through the wall of the fruit.

15. Inflorescences subtended by roots; stamens 3–4.
    16. Leaves oblong rotund; flowers yellow to yellow brown or yellow red; corolla lobes ca. 3 times the length of corolla tube; anthers 4; stigmas clavate rotund ..... 7. *H. davidsoniae*
    16′. Leaves oblong or obovate elliptic; flowers red; corolla lobes less than 2 times the length of the corolla tube; anthers usually 3; stigmas narrowly oblong .. 8. *H. eliasii*
15′. Inflorescences not subtended by roots; stamens 4(–6), often 3 in *H. ostaurea*.
    17. Leaves in unequal pairs (anisophyllous); flowers 1–2 per axil ..... 27. *H. witheringioides*
17′. Leaves in pairs similar in size; flowers many per axil.
    18. Anther connective not produced apically or basally.
        19. Flowers ca. 2 cm long at maturity; calycine lobes 4–5(–6); stamens 3–4; ovaries 3–4 loculate ..... 15. *H. lewisiana*
        19′. Flowers to 1.5 cm long at maturity; calycine lobes regularly 4; stamens (3–)4(–5); stigmas 2–3; ovaries 2–3 loculate.
            20. Leaves membranous; stamens 3(–4) ..... 19. *H. ostaurea*
            20′. Leaves thin chartaceous to subcoriaceous; stamens 4(–5).
                21. Stigmas lanceolate, sharp tipped ..... 13. *H. lancistigma*
                21′. Stigmas capitate rotund to linear oblong, blunt tipped.
                    22. Leaf blades rubescent, the pigment extractable on boiling; flowers subsessile ..... 24. *H. rubripigmenta*
                    22′. Leaf blades not rubescent, not yielding pigment on boiling; flowers obviously pedicellate.
                        23. Leaves chartaceous to subcoriaceous, not membranous and translucent on drying.
                            24. Leaves widely oblong to ovate subrotund, to 11 cm long, subcoriaceous, the lateral veins 7–9; inflorescences compressed, the flowers few ..... 6. *H. cercidifolia*
                            24′. Leaves elliptic or obovate elliptic, 9–35 cm long, chartaceous, the lateral veins (11–)15–20; inflorescences usually spreading, the flowers numerous ..... 20. *H. pittieri*
                        23′. Leaves membranous and translucent on drying.
                            25. Leaves to 25 cm long; pedicels 0.5

mm wide; calycine lobes to 1.1 mm long; corolla tube pubescent; stamens 3(–4) ..... 19. *H. ostaurea*

25′. Leaves 10–16 cm long; pedicels ca. 0.25 mm wide; calycine lobes 0.4–0.8 mm long; corolla tube glabrous; stamens 4 ..... 5. *H. capillacea*

18′. Anther connective produced apically or basally.

26. Leaves to 9.5 cm wide; anther connective produced basally; flowers purple ..... 9. *H. fimbrianthera*

26′. Leaves usually 3 cm wide; anther connective produced apically; flowers yellow ..... 28. *H. woodsonii*

6′. Leaves sessile.

27. Inflorescences with peduncles 3–6 cm long.

28. Leaves rounded toward the apex; calycine lobes 3–4 mm long ..... 11. *H. haydenii*

28′. Leaves acute or acuminate toward the apex; calycine lobes less than 1 mm long.

29. Inflorescences solitary in axils; plants prostrate .. 25. *H. subauriculata*

29′. Inflorescences several per axil or cauliflorous; plants upright ..... 2. *H. araneopedaria*

27′. Inflorescences with peduncles ca. 30 cm long ..... 17. *H. manussatani*

1. **Hoffmannia aeruginosa** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1313. 1938. TYPE: Costa Rica, *Austin Smith A86* (F).

Shrubs to 4 m tall, the branchlets slender, terete, the bark pale brown, ferrugineous villosulose, the hairs deciduous leaving a minutely tuberculate surface. *Leaves* oblong, to 20 cm long, to 8 cm wide, short acuminate at the apex, widely to narrowly cuneate at the base, the costa subplane and slender above, prominulous beneath, the lateral veins ca. 15, arcuate, prominulous, the intervenal areas often appearing lineolate under magnification, stiffly chartaceous, scarcely discolorous, drying green or brown, glandular shiny, glabrescent, minutely foveolate, the raphides moderately abundant, white, divergent, to 0.5 mm long, more conspicuous beneath, the costa ferrugineous pubescent, sometimes glabrescent; petioles 0.5–0.8 cm long, curved or reflexed, densely ferrugineous villosulose, to 3 mm wide; stipules not seen. *Inflorescences* in the uppermost axils, subsessile glomerules of 3–10 flowers, the reduced peduncles ferrugineous pubescent or purple villose. *Flowers* sessile, with the hypanthium to 1.7 mm long, villose with elongate, soft and ferrugineous hairs; calycine teeth subulate, to 1.5 mm long; corolla densely villose outside, the lobes acute; anthers ca. 3 mm long, acute at the apex, the connective not produced at the apex or base; stigmas 2, rotund or clavate, the ovary 2-loculate. *Fruit* not seen.

The species occurs in Costa Rica and Panama. The collection of *Austin Smith* (*H659*) from Guadalupe de Zarcero, Costa Rica, has the notes on the label: "Growing in deep forest shade; gregarious but very local. Base of the stem dull,

dark brown. Buds deep chokeberry red. Petioles and some of the veins of the under surface of the leaves tinged with pinkish red.''

BOCAS DEL TORO: Chiriqui Lagoon, *Wedel 2289* (MO).

2. **Hoffmannia araneopedaria** Dwyer.[59] TYPE: Panamá, *Gentry & Mori 14166* (MO, holotype).

Shrubs to 2 m tall, stem simple, lignose, terete, to 1.8 cm in diam.; bark with inconspicuous longitudinal lines, glabrous; nodal scars ringlike, the nodes well spaced. *Leaves* sessile, oblong, 12.5–32 cm long, 6–9 cm wide, short acuminate, obtuse or widely deltoid toward the apex, the acumen 1–1.2 cm long, basally attenuate and elongate cuneate below the middle, ultimately 8–10 mm wide and truncate or scarcely auriculate, the costa scarcely prominulous to immersed above, prominulous beneath, the costa slightly prominulous above, prominulous on the lower side only near the apex, prominent at the base, 2.5 mm wide, the lateral veins arcuate, the undulate submarginal veins inconspicuous, either absent or to 0.5 cm from the margin, the intervenal areas reticulate, stiffly papyraceous, concolorous, drying brown, glabrous above, minutely puberulent on the costa and veins beneath. *Inflorescences* cauliflorous or axillary; peduncles 8–12, 0.8–3 cm long, wiry, unequal, radially disposed from a single axil, arising from a compressed hemispherical swollen pad, ca. 1 cm wide, 0.5 cm long, the flowers to 6 on each axis, secundly disposed. *Flowers* (in bud) with pedicels red when living, 5–7 mm long, the hypanthium turbinate, 1 mm long, glabrous, ca. 8-ribbed, the calycine cup ca. 0.2 mm long, subturgid, the 4 lobes widely triangular, ca. 0.3 mm long, glabrous; corolla yellow, the tube carnose, glabrous, the 4 lobes triangular oblong, 2.8 mm long; anthers subbasifixed, the filaments short; ovarian disc cushionlike, narrower toward the apex, ca. 0.6 mm long, the style slender, the 2 ovate stigmas to 0.8 mm long. *Fruits* (perhaps immature), turbinate or oblong rotund, ca. 0.6 cm long, truncate, glabrous, not ribbed, white in living state.

Hoffmannia araneopedaria is known only from Panama. It is most closely related to *H. subauriculata* Standley which has similarly shaped, sessile leaf blades. The specific name *araneopedaria* means ''resembling a spider's legs'' a reference to the several wiry peduncles suggesting the legs of a ''Daddy long-legs.'' Some inflorescences are cauliflorous, an uncommon condition in *Hoffmannia*.

DARIÉN: Cerro Mali on Colombian border, S slope just below summit, lower montane wet forest-premontane wet forest transition, 1400 m, *Gentry & Mori 14166* (MO).

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[59] *Hoffmannia araneopedaria* Dwyer, spec. nov. *Frutices* ad 2 m alti, caule simplici glabro. *Folia* sessilia oblonga, 12.5–32 cm longa, 6–9 cm lata, versus apicem obtusa vel lato-deltoidea, venis lateralibus ca. 20, rigido-papyracea supra glabra subtus minuto-puberula. *Inflorescentiae* pedunculis 8–12 ab una axilla radiatis et ab area tumida compresso-haemosphaerica, ca. 1 cm lata, ca. 0.5 cm alta, floribus in axe utroque ad 6 secundatim dispositis. *Flores* pedicellis, cupula calycis ca. 0.1 mm longa, dentibus 4 lato-triangularibus, ca. 0.3 mm longis, glabris; corolla lutea tubo glabro lobis 4 oblongo-triangularibus, ca. 2.8 mm longis. *Fructus* his fortasse juveniles turbinati vel oblongo-rotundi, ca. 0.6 cm longi, truncati glabri non costati, in vivo albi.

3. **Hoffmannia areolata** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 52. 1940. TYPE: Panama, *Davidson 40* (F, holotype; isotype, MO).

Herbs to 2 m tall, the stems smooth, glabrous or villose. *Leaves* elliptic, to 25 cm long, to 8 cm wide, attenuate acuminate at the apex, the acumen to 3 cm long, cuneate at the base, the costa immersed above, plano compressed beneath, the lateral veins ca. 25, arcuate, glabrescent above, appressed villosulose on the costa beneath, chartaceous, concolorous, the raphides numerous, scattered, white, linear, to 0.3 mm long; petioles 1–4 cm long; stipules not seen. *Inflorescences* sessile, glomerules in the uppermost axils, to 2 cm long or longer, often wider than long. *Flowers* yellow or greenish, the hypanthium oblong, covered with elongate ferrugineous hairs to 1.6 mm long, the calycine lobes 4, ca. 3.5 mm long, obtuse; corolla ca. 4.5 mm long, the tube cylindrical, ca. 1 mm wide, the lobes shorter than the tube; stamens 4, ovate, ca. 1.5 mm long, the connective not produced at the apex or the base; stigmas 2, oblong, spreading, ca. 1.5 mm long, the style ca. 2.5 mm long. *Fruits* scarlet (fide Davidson).

Hoffmannia areolata is known only from Panama.

CHIRIQUÍ: Boquete, near Bajo Chorro, *Davidson 40* (F, GH, MO); *Woodson & Schery 661* (F, GH, MO).

4. **Hoffmannia bullata** L. O. Williams, Fieldiana: Botany 36: 52. 1973. TYPE: Guatemala, *Steyermark 38719* (F, holotype).

Subshrubs to 0.3 m tall, the stems simple, the lowermost nodes rhizophorous, the hairs dense, ferrugineous, the lenticels many, the nodes moderately well spaced. *Leaves* narrowly obovate oblong, 5–15 cm long, 1.5–5.0 cm wide, often slightly falcate, widely deltoid or rounded at the apex, the acumen inconspicuous, obtuse or cuneate toward the base, often abruptly contracted toward the base, the costa plane above or immersed, prominulous beneath, the lateral veins 8–14, arcuate, conspicuous and prominulous beneath, chartaceous, usually bullate at least on drying, discolorous, drying tan or silvery, glabrous above, the costa and veins below with golden, dense hairs, the raphides minute, white; petioles ca. 1.3 cm long, pubescent; stipules not seen. *Inflorescences* axillary; peduncles slender, to 2.5 cm long, ca. 0.7 mm wide. *Flowers* with hypanthium oblong or turbinate, glabrous, lightly costate, often seemingly alate on pressing, the teeth 4, to 1.5 mm long: (Williams) "dull brick red; calyx and hypanthium 3–4 mm long, the hypanthium turbinate, glabrous, the calyx lobes triangular or lance triangular, acute, sparsely villosulose; corolla about 1 cm long, glabrous, the lobes oblong, obtuse or acute, 2–3 times as long as the tube; stamens with short filaments, the anthers exserted." *Fruits* red; pedicels to 2 mm long, oblong or turbinate, 6–7 mm long, truncate at the apex, 4-angled, smooth, glabrous, lightly costate, the raphides abundant, the persistent calyx lobes obtuse.

Hoffmannia bullata is known from Mexico to Panama. Unfortunately the single Panamanian collection cited below lacks flowers so the floral description above is largely from Louis Williams' original diagnosis. *Steyermark 37241* (F), from the slopes of Volcan Tajumulco, Guatemala, 1,300–1,500 m, notes that the flowers have: "calyx pale green; corolla lobes spreading, salmon-brick color; anthers pale yellowish white, as in stigma."

Hoffmannia bullata is closely related to *H. pusulata* Dwyer, which has more numerous lateral veins and has been collected at a much lower elevation, less than 200 m.

PANAMÁ: Cerro Campana, 800 m, *Croat 12137* (MO).

5. **Hoffmannia capillacea** Dwyer, Ann. Missouri Bot. Gard. 56: 274. 1969. TYPE: Panamá, *Elias 1783* (MO, holotype).

Subshrubs, the stems lignose, smooth, glabrous, the petiole scars somewhat conspicuous, the nodes ca. 1 cm apart. *Leaves* oblong, 10–16 cm long, 5–7 cm wide, subacute and short acuminate at the apex, the acumen to 1 cm long, acute at the base and scarcely symmetrical, the costa subplane on both sides, the lateral veins ca. 10, subprominulous, the intervenal areas prominulous and spreading, membranous, discolorous, glabrous; petioles to 5 cm long, ca. 0.2 cm wide, lightly alate, strict; stipules not seen. *Inflorescences* cymes in the uppermost axils, glabrous; peduncles 1–15 mm long, ca. 0.3 mm wide, capillaceous; flowers 2–4 on spreading branches, often somewhat radially disposed. *Flowers* (in bud) with the pedicels 6–8 mm apart, capillaceous, to 0.4 mm wide, glabrous; hypanthium ca. 3 mm long, squarish, glabrous, carnose, the lobes 4, acute, glabrous; stamens 4, the anthers 2.5–3 mm long, the connective not produced at the apex or base, the filaments short, ca. 0.7 mm wide; stigmas 2, oblong rotund, ca. 1.5 mm long, wider than the style. *Fruits* not seen.

Hoffmannia capillacea is known only from Panama.

COCLÉ: Alto Calvario, 7 km N of El Copé, *Folsom 3314* (MO). SAN BLAS: Headwaters of Río Mulatupo, *Elias 1783* (MO).

6. **Hoffmannia cercidifolia** Dwyer, Ann. Missouri Bot. Gard. 56: 275. 1969. TYPE: Panamá, *Duke 15597* (MO).

Shrubs to 1½ m, the branchlets slender, smooth, glabrous. *Leaves* ovate subrotund or widely oblong, 7–11 cm long, 5.5–8 cm wide, short acuminate and deltoid apically, the acumen falcate or straight, to 1 cm long, ultimately subacute, basally obtuse or truncate, the costa subplane above with a thin median ridge, subplane beneath, the secondary veins 7–9, arcuate, prominulous beneath, discolorous, dark red brown and glabrescent above, beneath glabrous or golden puberulent on the costa and veins, glistening, above honeycomb-like under magnification; petioles slender, to 4.5 cm long, ca. 0.15 cm wide; stipules not seen. *Inflorescences* to 1 cm long, the flowers few, nodding, the peduncle reduced. *Flowers* (buds only) with the pedicels short, the hypanthium short, campanulate, ribbed, glabrous, the calycine cup short and scarcely measurable, the 4 triangular teeth ca. 1 mm long, carnose, glabrous except puberulent marginally; corolla white with the tube short, ca. 2.5 mm long, subcarnose, pubescent outside, glabrous within, the lobes 4, oblong, ca. 4 mm long; stamens 4, the anthers ca. 3.5 mm long, ca. 0.8 mm diam., the connective not produced at the apex or base, the filaments compressed; style ca. 5.5 mm long, the 2 stigmas clavate capitate. *Fruits* not seen.

The species is known only from Panama.

DARIÉN: Cloud Forest, Cerro Campamento, S of Cerro Pirre, *Duke 15597* (MO). VERAGUAS: 16 km NW of Santa Fé, road to Calovébora, 300–500 m, *Mori & Kallunki 6119* (MO).

7. **Hoffmannia davidsoniae** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 53. 1946. TYPE: Panamá, *Davidson 216* (F, holotype; isotype, MO).

Herbs to 1.5 m tall, the stems terete, smooth, glabrous, usually drying tan, the internodes to 9 cm long. *Leaves* oblong rotund, 8–17 cm long, 4–12 cm wide, rounded and acuminate at the apex, the acumen 0.5–1.8 cm long, basally rounded or tapering widely, abruptly cuneate, the costa prominulous to subplane above, prominent beneath, the lateral veins 12–15, widely arcuate, prominulous, 0.5–1.2 cm apart, thinly and stiffly succulent, lustrous, brown, white puberulent to glabrous above, minutely puberulent on veins beneath; petioles 2–7 cm long; stipules not seen. *Inflorescences* cymose, mostly subtended by roots, the peduncles elongate, strongly ascending, 5–10 cm long, 0.1–0.2 cm wide, rubescent, glabrous, terminated by 3–4, usually radially disposed and spreading branches, the cymules ascending, each branch 7–17-flowered. *Flowers* with the pedicels stiff, glabrous, to 5 mm long, ca. 0.3 mm wide; buds obviously acute at the apex; hypanthium strongly 6–8-ribbed, emerald green to red in living state, to 3 mm long, the calycine lobes flaring, deltoid, 0.3–0.5 mm long; corolla to 6 mm long, the lobes 4, much longer than the tube, glabrous; anthers 4, oblong, to 3.8 mm long, the connective not produced at apex or base, the filaments to 0.6 mm long; ovary 2-loculate, the style 4 mm long, the stigmas 2, clavate oblong, ca. 1.1 mm wide, each somewhat uncinate. *Fruits* oblong to 3.5 mm long, truncate, the persistent calycine teeth scarcely measurable, glabrous, delicately costate.

Hoffmannia davidsoniae is known only from Panama.

My own collection notes on this species (*Dwyer 8789*) are more elaborate than usual: "To 1 m tall; leaves smooth, lustrous, brown, stiffly succulent; inflorescence 17-flowered, glabrous, the peduncle thick, red green; hypanthium strongly angular, green; ovarian disc cushionlike; corolla rose, the tube glabrous, in bud flushed with red or pink, the anthers 4, the stigmas 2, clawlike, angular."

CHIRIQUÍ: Cerro Horqueta, 7000 ft, *Blum & Dwyer 2623* (MO). Río Chiquero, *D'Arcy 10983* (MO). Bajo Chorro, 6000 ft, *Davidson 216* (F, MO). Cerro Horqueta, *Dwyer & Lallathin 8789* (MO). Bajo Mona and Quebrada Chiquero, 1500 m, *Woodson & Schery 595* (MO). COCLÉ: Cero Pilón, 2900 ft, *Lallathin 133, 135* (both MO).

8. **Hoffmannia eliasii** Dwyer, Ann. Missouri Bot. Gard. 56: 276. 1969. TYPE: Panamá, *Kirkbride & Duke 1129* (MO).

Herbs to 10 cm high, succulent, the stems simple, horizontal at the base, lignose, 15–20 cm long, to 1.2 cm wide; roots fibrous, lignose. *Leaves* oblong or obovate elliptic, to 25 cm long, 9.5 cm wide, deltoid or subobtuse at the apex, scarcely acuminate, cuneate to narrowly cuneate at base, the costa prominulous above to subplane beneath, often lightly alate, the secondary veins 12–16, slightly arcuate, prominulous, to 1.8 cm apart, the intermediate veins irregular and soon branching, then evanescent, the ultimate venules spreading pinnatiform, the marginal vein conspicuous, ca. 7 mm from the margin, stiffly chartaceous, scarcely discolorous, glabrescent, the hairs on the costa and the veins few; subsessile or petiolate, the petioles to 12 cm long, often lightly alate; stipules not seen. *Inflorescences* 1–3 cm long, to 2 cm wide, subtended by roots, the peduncles 2 per

axil, often stiff, to 4.5 cm long, often marcescent, canaliculate, pilose, the hairs weak and spreading. *Flowers* sessile or on pedicels to 4 mm long; hypanthium campanulate, ca. 2 mm long, glabrous, black when dry, ribbed, the calycine teeth 4, somewhat unequal, erect, subulate, 1–1.8 mm long, minutely puberulent; corolla glabrous, the tube cylindrical to 2.5 mm long, the lobes 4, lanceolate, longer than the tube; stamens 3, the anthers 3–4 mm long, subsessile, the filaments ca. 0.2 mm long, the style narrow cylindrical, the connectives not produced at the base or the apex; stigmas 2, unequal, oblong, to 0.7 mm long, scarcely wider than the style. *Fruit* (immature) with pedicels strongly ascending, to 4 mm long, diffusely pilose, oblong, to 5 mm long, to 2.5 mm wide, the calyx persistent, the lobes 1–2.5 mm long, red when dry, moderately ribbed, minutely puberulent.

The species is known only from Panama and nearby Colombia.

DARIÉN: Caná-Cuasí Trail, Chepigana, 4000 ft, *Terry & Terry 1508* (F, GH, MO). Río Cuasí mainstream, 2.5 mi S of Tres Bocas, *Kirkbride & Duke 1129* (MO). SAN BLAS: Headwaters Río Mulatupo, *Elias 1779* (MO). Mountains above Puerto Obaldía, *Gentry 1504* (MO). COLOMBIA: CHOCO: Río Nercua, Quebrada Barrial and Quebrada Ambrosio near Camp Curiche, *Duke 11438* (MO).

9. **Hoffmannia fimbrianthera** Dwyer, Ann. Missouri Bot. Gard. 56: 277. 1969. TYPE: Panamá, *Kirkbride & Duke 556* (MO, holotype).

Subshrubs, the stems smooth, reed-like, glabrous, terete, the internodes to 15 cm long. *Leaves* oblong rotund, often subfalcate, to 19 cm long, to 9.5 cm wide, deltoid at the apex, short acuminate, the acumen to 1.5 cm long, basally acute or narrowly cuneate at the base, the costa plane above, subprominent beneath, the lateral veins ca. 15, divergent-arcuate, conspicuously prominulous beneath, the veinlets spreading pinnatiform, the submarginal vein ca. 8 mm from the margin, papyraceous, scarcely discolorous, drying grey, conspicuously honeycomb-like under magnification, glabrescent above, granulose puberulent only on the veins beneath; petioles slender, lax, to 7 cm long, to 1.2 mm wide, minutely webby puberulent; stipules not seen. *Inflorescences* sessile, the flowers few, (3–)5(–10). *Flowers* subsessile or on pedicels to 1 mm long; hypanthium rotund oblong, ca. 3 mm long, somewhat smooth, stiffly carnose, ferrugineous puberulent, the calycine lobes 4, spreading uncinate subulate, to 1 mm long, puberulent; corolla carnose, ferrugineous puberulent outside, minutely farinose within, the lobes 4 (?); stamens 4, the anthers oblong, to 3.2 mm long, minutely apiculate, the connective petaloid fimbriate at the base for 0.3 mm long; style to 3.5 mm long, 0.2 mm wide, wider toward the apex, the stigmas 2, clavate, ca. 0.35 mm wide. *Fruits* not seen.

Hoffmannia fimbrianthera is known only from Panama.

BOCAS DEL TORO: Río Teribe, just below Puerto Palenque, 350 m, *Kirkbride & Duke 556* (MO).

10. **Hoffmannia gentryi** Dwyer.[60] TYPE: Panamá, *Gentry & Mori 14061* (MO, holotype).

Subshrubs to 1.5 m tall, the branchlets weak, angular when dry, villose, the hairs persistent or deciduous, curled, swollen at the base, the nodes moderately

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[60] *Hoffmannia gentryi* Dwyer, spec. nov. *Suffrutices* ad 1.5 m alti, ramulis debilibus. *Folia* oblonga vel obovato-oblonga, 12–20 cm longa, 5–10 cm lata, plerumque versus apicem deltoidea,

well spaced. *Leaves* oblong or ovate oblong, 12–20 cm long, 5–10 cm wide, deltoid toward the apex, occasionally acute, acute or obtuse at the base, rarely subtruncate, the costa prominulous on both sides, the lateral veins ca. 10, arcuate and scarcely prominulous, the intervenal areas lightly reticulate, the undulate submarginal vein to 5 mm from the margin, membranous, scarcely discolorous, hairy on both sides, the hairs on upper surface few, subulate, spreading or appressed, mostly confined to the costa and the veins, below more dense, often curled and giving a webby effect; petioles weak, slender, often curved, to 4.5 cm long, densely hairy; stipules deciduous. *Inflorescences* axillary, to 2.5 cm long; peduncle slender, to 1.5 cm long, ca. 0.3 mm wide, the cymes 4–5-flowered, the flowers unilaterally and helicoidally disposed. *Flowers* subsessile, densely villose, the hypanthium turbinate, to 2.5 mm long, the lobes 4, narrowly oblong; corolla light green, subcampanulate, the tube about as long as the calycine teeth, perhaps glabrous outside, raphides abundant, the lobes 4, longer than the tube; stamens 4, erect, the anthers oblong, ca. 4 mm long, subsessile, attached near the mouth; style slender, exceeding the anthers, the stigmas connate, clavate, ca. 1.5 mm long. *Fruits* not seen.

Hoffmannia gentryi is named in honor of one of the co-collectors of the type, a distinguished student of the flora of Panama. It is known only from Panama, although it no doubt occurs in adjacent Colombia. It is distinguished by its membranous leaves adorned with adpressed and often curled hairs; the hypanthium is replete with elongate hairs and the calycine cup has teeth as long as the corolla tube. The flowers being unilaterally and helicoidally disposed distinguishes it from *H. aerolata* to which it seems closely related.

DARIÉN: Cerro Tacarcuna, summit camp, along stream N of camp, 1550–1650 m, *Gentry & Mori 14061* (MO).

11. **Hoffmannia haydenii** Dwyer, Ann. Missouri Bot. Gard. 56: 277. 1969. TYPE: Panamá, *Hayden 177* (MO, holotype).

Herbs, the stems drying quadrangular. *Leaves* sessile, obovate elliptic or oblong, to 35 cm long, to 14 cm wide, rounded toward the apex, short acuminate, the acumen to 1.5 cm long, basally narrow cuneate and ultimately auriculate, the costa prominulous, slender and ridgelike above, beneath subplane, to 2.5 mm wide proximally, puberulent, the lateral veins ca. 20, somewhat plane above, prominulous beneath, coriaceous, discolorous on drying, glabrescent and brown above, puberulent on costa and veins beneath; stipules not seen. *Inflorescences* 1.5–7 cm long, the peduncles 1.2–6 cm long, subtended by roots, capillaceous, ca. 0.3 mm wide, the branches strict, puberulent, red in living state, to 2.5 mm long, puberulent. *Flowers* with buds cuneate and acute at the apex; hypanthium puberulent, scarcely ribbed, the calycine lobes 4, erect lanceolate, 3–4 mm long, purple red when dry, puberulent; corolla lobes 4, ca. 5 mm long, puberulent outside, longer than the tube; stamens 4, the anthers ca. 4 mm long, the connec-

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venis lateralibus ca. 10, membranacea utrinque ciliata praesertim subtus; petiolis debilibus, ad 4.5 cm longis. *Inflorescentiae* ad 2.5 cm longae, pedunculo gracilissimo, cymis floribus 4–5 unilateraliter dispositis. *Flores* hypanthio dense elongato-ciliato dentibus 4 ad 3 mm longis; corolla tubo brevi lobis ad 4 mm longis; staminibus subsessilibus, antheris 4 oblongis, ca. 4 mm longis, exsertis. *Fructus* non visi.

tive not produced at the apex or the base, the filaments short; stigmas 2, aggregated. *Fruits* not seen.

Hoffmannia haydenii is known only from Panama.

CHIRIQUÍ: Finca Collins, ca. 5000 ft, *Hayden 117* (MO).

12. **Hoffmannia kirkbridei** Dwyer, Ann. Missouri Bot. Gard. 56: 278. 1969. TYPE: Panamá, *Kirkbride & Duke 429* (MO, holotype).

Subshrubs to 2 m tall, the stems glabrous, drying minutely rugulose. *Leaves* elliptic oblong to 40 cm long, to 20 cm wide when dry, the costa prominulous and canaliculate above, subprominent beneath, distinctly corky alate toward the base, the lateral veins 15–25, ca. 3 cm apart, arcuate, scarcely prominulous above, conspicuously prominulous beneath, the intermediate veins more divergent, soon evanescent, the veinlets spreading, irregularly pinnatiform with patches of simple appressed hairs on the costa and veins beneath, the hairs few, stellate, stiffly chartaceous, discolorous when dry; petioles to 13 cm long, ca. 3 mm wide in the middle, inconspicuously swollen below the base of the blade, the vescicles 0.6–10 cm long, ca. 1 cm wide when dry. *Inflorescences* often 3 per axil, the peduncles reflexed, 1–1.5 cm long, ca. 0.13 cm wide, with minute patches of crystalline hairs and raphides, the hairs few, to 0.7 mm long, rarely stellate. *Flowers* (juvenile fruit) subsessile; hypanthium short, moderately villose, the raphides thick, white; calycine cup somewhat turgid, villose, the lobes 4, thickly carnose to 4.5 mm long, to 3.5 cm wide, ciliate, the veins few, ascending, the wall of the hypanthium thick. *Fruits* (immature) rhomboid, ca. 6 mm in diam.; seeds thickly reticulate.

Hoffmannia kirkbridei is known only from Panama.

BOCAS DEL TORO: Buena Vista, Almirante, *Cooper 225* (F). Quebrada Huron, ca. 300–400 ft, *Kirkbride & Duke 429* (MO).

13. **Hoffmannia lancistigma** Dwyer, Ann. Missouri Bot. Gard. 56: 279. 1969. TYPE: Panamá, *Dwyer & Hayden 7735* (MO, holotype).

Shrubs, the stems canelike, terete, smooth, the hairs minute, dense, ferrugineous, moniliform, deciduous, the nodes 2.5–3.5 cm apart. *Leaves* strongly ascending, well spaced, oblong, to 19 cm long, to 9 cm wide, obtuse at the apex, scarcely short acuminate, ultimately obtuse, cuneate at the base, often asymmetrical, the costa prominulous above and beneath to 0.15 cm wide, the lateral veins ca. 15, arcuate, prominulous beneath, the intermediate veins spreading pinnatiform, papyraceous or stiffly chartaceous, minutely granulose and honeycomb-like under magnification, the hairs few beneath, except on the densely pubescent costa; petioles to 7.5 cm long, ferrugineous; stipules not seen. *Inflorescences* usually 1 per axil, often arising from a leafless part of the twig, the peduncle ascending, to 10 cm long, slender, ca. 2 mm wide, strict or arcuate, glabrescent or with few crystalline hairs. *Flowers* glabrous (?); hypanthium oblong, to 3.8 mm long, ribbed, the calycine teeth 4, erect, triangular, ca. 1 mm long; corolla tube thin carnose, the lobes 4(–6), ca. 4.5 mm long, carnose; stamens 4, the anthers ca. 3.8 mm long, to 1.2 mm wide, the connective not produced at

apex or base, the filaments ca. 1 mm long, flat, to 1 mm wide; style ca. 4 mm long, the stigmas 2, lanceolate, ca. 2.8 mm long, to 0.8 mm wide, thick, wider than the style, constricted medially. *Fruits* not seen.

Hoffmannia lancistigma is known only from Panama.

CHIRIQUÍ: Cerro Horqueta, ca. 6000 ft, *Dwyer & Hayden 7735* (MO, SCZ, UC).

14. **Hoffmannia lenticellata** Hemsl., Diag. Pl. Nov. 30. 1879. SYNTYPES: México, *Botteri 974*; *Bourgeau 2992*; *Linden 1*, none seen.

Shrubs to 1.5 m, the branchlets smooth, minutely puberulent to glabrescent, the nodes well spaced, the pith porate. *Leaves* elliptic to oblong elliptic, 8–15 cm long, 2.5–5 cm wide, widely deltoid or rounded at the apex but distinctly short acuminate, the acumen to 1.5 cm long, slender, often falcate, attenuate acute toward the base, slightly decurrent along the petiole, the lateral veins 14–20, arcuate, plane and somewhat inconspicuous above, prominulous beneath, not forming a distinct marginal vein, the veinlets inconspicuous, rigidly papyraceous, scarcely discolorous, presumably glabrous above, glabrescent to minutely puberulent on the midvein and the lateral veins, often the upper surface with small patches of white round crystals; petioles 0.5–2.5 cm long; stipules not seen. *Inflorescences* axillary, sessile or on reduced peduncles, the cymes few flowered. *Flowers* not seen. *Fruits* somewhat congested, puberulent, to 4 cm long, the peduncle absent or to 0.5 cm long; pedicels to 2 mm long, the pericarp oblong, to 4 mm long, truncate, the lobes 4, erect triangular or oblong, to 1 mm long, acute to obtuse, puberulent, concave within, rigid, the persistent ovarian disc compressed annular, the fruit body with 8 narrow but prominent ribs.

Hoffmannia lenticellata extends from Mexico to Panama.

This species demands extensive study. Many collections labelled *H. lenticellata* from Middle America have been misidentified. The value of the patches of crystals on the leaf blades as a distinguishing character needs assessment. Standley in his key to species of *Hoffmannia* in North American Flora used the character that the corolla lobes are 2 times as long as the tube; no flowers were available on the single collection from Panama seen.

CHIRIQUÍ: Road Between Cerro Punta and Las Nubes, 1800–2100 m, *Croat 26399 (MO)*.

15. **Hoffmannia lewisiana** Dwyer, Ann. Missouri Bot. Gard. 56: 279. 1969. TYPE: Panamá, *Ridgway & Solis 2413* (MO).

Shrubs, the branchlets smooth, glabrous, canaliculate. *Leaves* oblong, 17–19 cm long, 7–8 cm wide, somewhat attenuate acute and acuminate at the apex, the acumen to 1.5 cm long, acute and almost symmetrical at the base, the costa subplane above, canaliculate, prominulous beneath, to 0.15 cm wide, the lateral veins ca. 12, plane above, prominulous beneath, arcuate, ultimately spreading reticulate, papyraceous, concolorous, glabrous above, pubescent beneath only on the costa and veins, petioles to 4.5 cm long, glabrous; stipules not seen. *Inflorescences* to 6.5 cm long, spreading, the peduncles short, the branches numerous, 2.4 cm long, 0.8–1.8 mm wide, the cymes few, alternate or often sub-

radiate. *Flowers* with the buds clavate; pedicels 1–7 mm long, ca. 0.4 mm wide, densely white puberulent; hypanthium oblong, to 7 mm long, carnose, puberulent and conspicuously ribbed, the teeth 4–6, erect, deltoid, unequal, often one conspicuously reduced, to 2.5 mm long, puberulent; corolla with the tube to 11 mm long, carnose, the lobes 5, to 5.5 mm long, acute, puberulent outside; stamens 4–5, the anthers ca. 3.5 mm long, ca. 1.3 mm wide, the connective not produced at the apex or base, the filaments compressed, ca. 1 mm wide; style 12–14 mm long, the stigmas (2–)3–4, capitate. *Fruits* not seen.

Hoffmannia lewisiana is known only from Panama.

CHIRIQUÍ: Cerro Punta, 6800 ft, cloud forest and distrubed edge, *Ridgway & Solis 2413* (MO).

16. **Hoffmannia longicalycina** Dwyer, Ann. Missouri Bot. Gard. 56: 280. 1969. TYPE: Panamá, *Kirkbride & Duke 1278* (MO, holotype).

Subshrubs, the branchlets smooth, glabrous, the nodes ca. 1 cm apart. *Leaves* oblong, tapering cuneately toward the apex, acuminate, the acumen short, to 1 cm long, ultimately acute, narrowly cuneate at the base, the costa prominulous and ridged beneath, to 2 mm wide, the lateral veins ca. 16, spreading arcuate, prominulous, rigidly chartaceous, slightly discolorous, green when dry, glabrescent above, appressed ciliate on the costa and the veins beneath, the hairs often rigid and appressed falcate; petioles to 10 cm long, angular to compressed, ca. 0.2 cm wide, the hairs white, thickly subulate, forming a thin crust; stipules not seen. *Flowers* not seen. *Fruits* oblong, terete in cross section, to 12 mm long, ca. 7 mm wide, delicately costate, pubescent with weak ferrugineous hairs to 2 mm long; persistent lobes of calyx 5, erect, linear lanceolate, to 12 mm long, ca. 2 mm wide, petaloid and pubescent; seeds numerous, thickly reticulate, ca. 0.5 mm in diam., visible through the thin wall.

Hoffmannia longicalycina is known only from Panama.

DARIÉN: Caná-Cuasí Trail between Cerro Campamento and La Escalera to "paramo," E of Tres Bocas, *Kirkbride & Duke 1278* (MO).

17. **Hoffmannia manussatani** Dwyer.[61] TYPE: Panamá, *Allen 4978* (MO, holotype).—FIG. 50.

Herb to 3 ft tall, the stem perhaps unbranched, 4-angled, smooth, glabrous, the nodes well spaced. *Leaves* sessile, obovate oblong or spatulate, ca. 20 cm long, 6.0–6.5 cm wide, narrowly acuminate at the apex, the acumen to 1.5 cm long, acute, the blade obviously contracted below the middle, at base vaguely auriculate, to 2.5 cm wide basally, the costa prominulous above with a central

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[61] *Hoffmannia manussatani* Dwyer, spec. nov. *Herbae* caulibus 4-angularibus glabris. *Folia* sessilia obovato-oblonga vel spathulata, ca. 20 cm longa, 6.0–6.5 cm lata, acuminata, basi infra medium attenuato-spathulata proximaliter modice auriculata venis lateralibus ca. 18 chartacea glabra. *Inflorescentiae* axillares pedunculo elongato ad 30 cm longo, floribus terminalibus in caespitibus pauciforis congestis ad 2.5 cm latis, jugis tribus bractearum bene distantibus in pedunculo, bracteis magnis plerumque ovato-oblongis, ad 9 mm longis. *Flores* hypanthio ferrugineo-villosuloso, lobis calycis 4, ca. 3 mm longis; corolla lobis 4, ad 4 mm longis; staminibus sessilibus antheris 4, ad 4 mm longis. *Fructus* non visi.

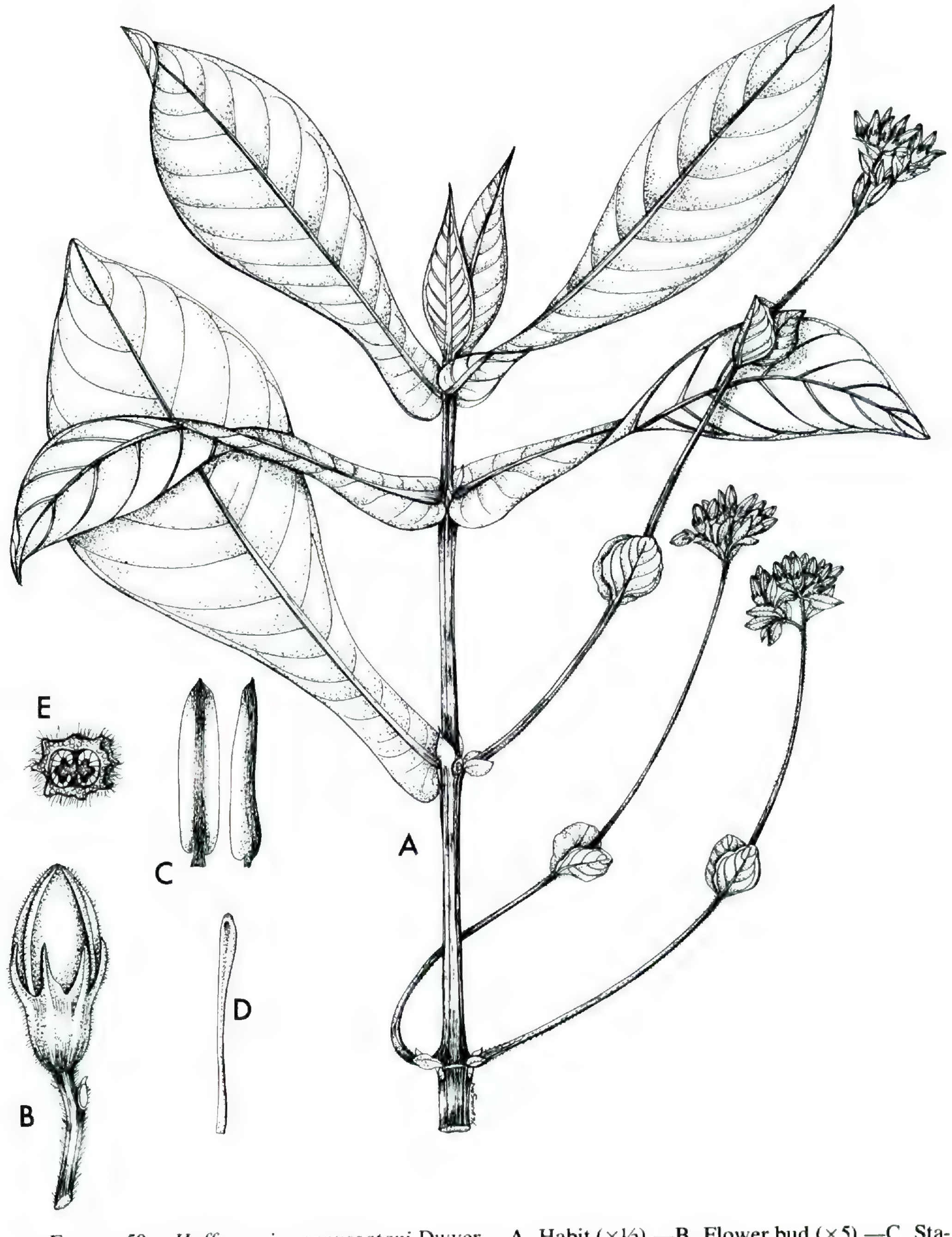

FIGURE 50. *Hoffmannia manussatani* Dwyer.—A. Habit (×½).—B. Flower bud (×5).—C. Stamens (×5).—D. Style (×5).—E. Ovary cross section (×5). [After *Allen 4978.*]

depression, prominulous beneath, ca. 0.2 mm wide proximally, the lateral veins ca. 18, arcuate, the submarginal vein inconspicuous and proximate to the margin, the veinlets pinnatiform, chartaceous, concolorous, drying reddish, glabrous; stipules widely triangular, to 0.6 cm long, wider than long, thickly chartaceous, glabrous. *Inflorescences* axillary, elongate pedunculate, the peduncles flagelli-

form, to 30 cm long, twisted, angular, puberulent, 1.6–2.3 mm wide basally, with 4 pairs of bracts, the basal bracts much reduced, rotund, to 3.5 mm long, the other 2 pair well spaced, one pair at the apex of the lower ⅓ of the peduncle, the other at the base of the upper ⅓, rotund or ovate rotund, 1.6–2.5 cm long, obtuse or rounded at the apex, stiffly chartaceous, ascending, the costa and veins evident, disposed as in the leaves, the flowers few, loosely aggregated in a terminal rotund or compressed rotund head, to 2.5 cm in diameter, presumably of few cymules; bracts oblong or ovate oblong, 7–9 mm long, stiff, ciliolate marginally and on the keel, usually narrowing toward the apex. *Flowers* sessile (in bud), the hypanthium turbinate, ca. 2 mm long, densely ferrugineous villosulose, the calycine cup short, the calycine lobes 4, narrowly triangular, ca. 3 mm long, ca. 1 mm wide, obtuse, thickly carnose especially dorsally, ferrugineous ciliolate at the base outside and marginally, glabrous within; corolla lobes 4, oblong, ?4 mm long, carnose; stamens sessile, the anthers 4, rectangular oblong, to 4 mm long, to 1.2 mm wide; style slender, to 5.5 mm long, ca. 0.4 mm wide, obtuse at the apex, the stigmas not distinct, the ovarian disc compressed, to 1.8 mm wide, the ovules numerous, subrotund, ca. 0.05 mm wide, compressed, reticulate.

Hoffmannia manussatani is known only from Panama. A combination of sessile leaves and a peduncle of extraordinary length bearing 3 pairs of bracts along its length readily distinguish it from all other species of *Hoffmannia*.

BOCAS DEL TORO: Róbalo Trail, slopes of Cerro Horqueta, 6000–7000 ft, *Allen 4978* (MO).

18. **Hoffmannia morii** Dwyer.[62] TYPE: Panamá, *Mori & Kallunki 5915* (MO, holotype).

Subshrubs to 1 m tall, the stem simple, obtusely angular, rimose, glabrous or glabrescent, covered with mosses, the nodes to 4 cm apart. *Leaves* widely oblong, 13–25 cm long, 7–12 cm wide, deltoid at the apex, obtuse or widely cuneate toward the base, the costa subplane above, prominent beneath, the lateral veins ca. 10, arcuate, not joining to form a conspicuous submarginal vein, thin coriaceous when dry, slightly discolorous, glabrous above, puberulent beneath on the veins and costa, often moss covered; petioles to 3 cm long, to 1 mm wide, not vesciculiferous or with poorly developed vescicles. *Inflorescences* axillary and terminal, the flowers numerous in globose heads, 2 cm in diam. *Flowers* with pedicels ca. 2.5 cm long; hypanthium subrotund or turbinate, ca. 2 mm long, the hairs elongate, to 3 mm long, the calycine cup ca. 2 mm long, the lobes 4, narrowly oblong, ca. 4.5 mm long, thickly petaloid or subcoriaceous with purple hairs to 2 mm long outside; corolla tube narrowly cylindrical, glabrous, 5 mm long, 2.5 mm wide, thickly petaloid, the lobes 4, oblong, triangular, ca. 3 mm long, cucullate; stamens 4, the anthers oblong ca. 3 mm long, the filaments ca. 1 mm

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[62] *Hoffmannia morii* Dwyer, spec. nov. *Suffrutices* ad 1 m alti. *Folia* lato-oblonga, 13–25 cm longa, 7–12 cm lata, apice deltoidea, venis lateralibus circa 10 arcuatis, tenui-coriacea supra glabra subtus in venis et costa puberula saepe. *Inflorescentiae* axillares et terminales floribus dense confertis in capitula globosa circa 2 cm diam. *Flores* pedicellis 2.5 mm longis; cupula calycis 2 mm longa, lobis 4 angusto-oblongis 4.5 mm longis, extus ciliis purpureis elongatis ad 2 mm longis ornatis, intus glabris; corolla tubo 5 mm longo, lobis 4 oblongo-triangularibus, 3 mm longis; staminibus 4 antheris oblongis 3 mm longis filamentis 1 mm longis; stylo 6.5 mm longo stigmatibus ovatis.

long, attached above the middle of the tube; style slender, ca. 6.5 mm long, slightly expanded toward the apex, the stigmas 2, ovate, ca. 2–8 mm long, ca. 1.5 mm wide, conspicuously thickened. *Fruits* not seen.

Hoffmannia morii is known only from Panama. It is named in honor of Dr. Scott Mori whose collections of Panamanian Rubiaceae have been of great assistance.

The new species is closely related to *H. vesciculifera* Standley. The latter has conspicuous inflations or vescicles on the petioles which are not present or at least not well developed in the new species, although some smaller leaves of the new species have conspicuously dilated petioles. The leaf blades average 10 lateral veins while *H. vesciculifera* has 12–25 lateral veins. The hypanthium of the new species is hairy in contrast to *H. vesciculifera* and the calycine lobes are much shorter than in Standley's species.

This species is known only from the type collection.

CHIRIQUÍ: N of San Félix at Chiriquí-Bocas del Toro border, road to Cerro Colorado mine, 5000–5500 ft, *Mori & Kallunki 5915* (MO).

19. **Hoffmannia ostaurea** Dwyer, Ann. Missouri Bot. Gard. 56: 280. 1969. TYPE: Panamá, *Kirkbride & Duke 501* (MO, holotype).

Succulent *subshrubs*, the branchlets canaliculate when dry, glabrescent, with crustose patches of hairs (under magnification), the juvenile branchlets with many raphides, the internodes 1.5–3 cm long. *Leaves* elliptic, to 25 cm long, to 7.5 cm wide, deltoid and short acuminate apically, the acumen to 1 cm long, the costa plane on both sides, the lateral veins 12–15, spreading and arcuate, slender, the intermediate veins irregular pinnatiform with intervenal areas conspicuously spreading, thinly membranaceous, concolorous, glabrous but with vermiform raphides to 0.3 mm long; petioles arcuate ascending, to 8 cm long, 0.2–0.15 cm wide, glabrous, the raphides to 0.3 mm long; stipules not seen. *Inflorescences* to 1.5 cm long, the peduncle capillaceous, the flowers few. *Flowers* (buds) with the hypanthium oblong rotund, ca. 2 mm long, smooth, the calycine lobes 4, unequal, subulate, to 1.2 mm long, the raphides thick, white; corolla subcarnose, the lobes presumably 4; filaments short; stigmas 2, capitate, ca. 1 mm long. *Fruits* on pedicels to 5 mm long, rotund, to 5 mm in diam., red and red purple when dry.

Hoffmannia ostaurea is known only from Panama.

BOCAS DEL TORO: Río Teribe between Quebrada Huron and Quebrada Schlunjik, *Kirkbride & Duke 501* (MO).

20. **Hoffmannia pittieri** Standley, Contr. U.S. Natl. Herb. 18: 140. 1916. TYPE: Panamá, *Pittier 3247* (US).

H. panamensis Standley, Contr. U.S. Natl. Herb. 20: 204. 1919. TYPE: Panamá, *Pittier 3056* (US).

Shrubs to 8 m tall, the stouter branches smooth, drying tan, terete, glabrous, the pith porate. *Leaves* elliptic or obovate elliptic, 9–35 cm long, 8–12 cm wide, 2.5–3 times longer than wide, acute to cuneate, rarely subrotund at the apex, short acuminate, the acumen to 2 cm long, basally acute to attenuate acute, the

costa prominulous above, prominulous to prominent beneath, often ligneous, to 2.5 mm wide, the lateral veins (11–)15–20, widely arcuate, 1(–2.2) cm apart, with 1–2 conspicuous irregular veins between each pair of lateral veins, chartaceous, usually slightly discolorous, usually drying tan or brown, glabrous; petioles 5.5–7 cm long, 1.5–3 mm wide; stipules not seen. *Inflorescences* in the uppermost axils, spreading, 3–9 cm long, the primary peduncle compressed as a nodal pad, or elongate, the fasciculate branches 1–4, the flowers usually spreading. *Flowers* with the pedicels to 15 mm long, stiff, glabrous; hypanthium carnose, ribbed, puberulent to glabrous, the calycine teeth 4, triangular, 0.6–2 mm long; corolla yellow to greenish white, to 13.5 mm long, subcarnose, glabrous to sparsely puberulent, the lobes 4(–5), 2.3–4.3 mm long, 1.7–3 mm wide; stamens 4, the anthers 2.3–4.5 mm long, the connective not produced at apex or base, the filaments to 1.8 mm long; ovary 2–4-loculate, the style to 11 mm long, the stigmas usually ball shaped, 1.2–1.8 mm long, wider than the style, each stigma ovate oblong to cordate. *Fruits* subrotund; calycine lobes persistent, to 6.5 mm long, glabrous, drying red brown, scarcely ribbed; seeds brown, foveolate.

Hoffmannia pittieri is known only from Panama. *Folsom 2211* and *2212* have exceptionally large fruits, to 1.4 cm long, and drying tan. Apparently the fleshy portion surrounding the seeds did not shrink as usual on drying. The fruits of the 2 collections are described as "white and pink."

CHIRIQUÍ: Róbalo Trail, N slope of Cerro Horqueta, 6000–7000 ft, *Allen 4962* (MO). Cerro Horqueta, 7000 ft, *Blum & Dwyer 2599* (MO). Cerro Horqueta, *Blum & Dwyer 2643* (MO). Cerro Horqueta, 7000 ft, *Blum & Dwyer 2647* (MO). Las Nubes, 5.5 km NW of Río Chiriquí Viejo, W of Cerro Punta, 2200 m, *Busey 679 A* (MO). Cerro Horqueta, *Cochrane et al. 6244* (MO). Monte Rey above Boquete, *Croat & Porter 15655* (MO). Between Boquete & Monte Rey, *Croat 15823* (MO). Alto Respinga and above, 2800 m, *D'Arcy 9967* (MO). Above Boquete on La Popa, 5400 ft, *D'Arcy & D'Arcy 6371* (MO). Above Boquete, road to La Popa, *D'Arcy & D'Arcy 6372* (MO). Bajo Chorro, Boquete, 6000 ft, *Davidson 47* (MO). Bajo Chorro, Boquete, *Davidson 51* (MO). Cerro Horqueta, *Duke et al. 13651* (MO); *Dwyer 8765, 8790* (both MO). Boquete, Finca Collins, ca. 5000 ft, *Dwyer & Hayden 7654* (GH, K, MO, UC, US). NW of Boquete, Cerro Horqueta, 5000–5800 ft, *Dwyer et al. 525* (MO). Boquete, Finca Collins, *Dwyer & Hayden 7665* (GH, F, K, MO, NY, UC, US). Boquete, Cerro Horqueta, *Dwyer & Hayden 7745* (GH, MO). Cerro Horqueta, *Dwyer & Lallathin 8783* (MO). Boquete, *Folsom 2211, 2212* (both MO). Boquete, Finca Collins, *Hayden 163* (MO). Boquete, Finca Collins, *Kirkbride 117* (MO). Cerro Horqueta, 5000–7000 ft, *Kirkbride 147* (MO). Between Pinola & Quebrado Hondo, toward summit on Chiriqui Trail, *Kirkbride & Duke 894* (MO). Cerro Punta, 6800 ft, *Ridgway & Solis 2393* (MO). Upper Río Chiriquí Viejo, near Monte Lirio, 1300–1900 m, *Seibert 165* (MO). Palo Alto, E of Boquete, *Stern et al. 1025* (MO). Boquete, Finca Collins, 5500 ft, *Stern et al. 1127* (MO). 6 mi above Cerro Punta, Boquete Trail, ca. 750 ft, *Tyson 7168* (MO). Above Jamarillo Arriba, N slopes of Cerro Palo Alto, 4900 ft, *Webster 11674* (MO). Valley of upper Río Chiriquí Viejo, *White & White 2, 26* (both MO). Río Chiriquí Viejo Valley, *White 74* (MO). Bajo Mona & Quebrada Chiquero, 1500 m, *Woodson & Schery 538* (MO). Bajo Mona & Quebrada Chiquero, 1500 m, *Woodson & Schery 561* (MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 839* (MO). COCLE: Cerro Pilón, 2900 ft, *Lallathin 434* (MO).

21. **Hoffmannia psychotriifolia** (Benth.) Griseb., Fl. Brit. W. Ind. 321. 1861.—FIG. 51.

Higginsia psychotriaefolia Benth. in Oerst. Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 50. 1852. TYPE: Costa Rica, *Oersted 11507*, not seen.

Shrubs to 2.5 m tall, the stems ultimately slender, terete, glabrous, rubescent. *Leaves* oblong, to 20 cm long, to 8 cm wide, usually 3–4 times longer than wide, acute and finally attenuate acuminate at the apex, the acumen to 2.5 cm long,

FIGURE 51. *Hoffmannia psychotriifolia* (Benth.) Griseb.—A. Habit (×.45).—B. Flower, opened to show interior (×4.95).—C. Ovary cross section (×4.95). [After *Croat 15976*.]

acute and oblique at the base, the lateral veins 10–12, widely arcuate, stiffly chartaceous, concolorous or discolorous, glabrescent, usually with minute, scattered white raphides on both the surfaces; petioles to 9 cm long, and 2 mm wide, stipules not seen. *Inflorescences* in the axils of the uppermost leaves, the pedun-

cles reduced to a pad or to 8 mm long, the flowers radially disposed, ca. 7 per inflorescence. *Flowers* on slender pedicels to 4 mm long, white, to 12 mm long; hypanthium 2–4 mm long, scarcely ribbed, often with abundant red raphides, the calycine teeth 4, deltoid, 0.8–2 mm long, acute; corolla 8–11 mm long, the lobes 4, thickly petaloid, often longer than the tube; stamens 4, the anthers 2–2.8(–4) mm long, the connective not produced at the apex or the base, the filaments 0.5–1 mm long; ovary 2–3-loculate, the style to 5.5 mm long, the stigmas 2, linear, spreading at maturity, 2–3.3 mm long. *Fruits* on radiate, slender pedicels, shorter than the fruit; fruit oblong to ovate oblong, obtuse or truncate at apex, to 8 mm long, at least 2 times longer than wide, at first delicately ribbed, smooth, glabrous, often drying yellow, finally fleshy, in vivo china red, pink or purple.

The species ranges from Guatemala to Panama, and it also occurs in the West Indies.

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, *Allen 1329* (MO). Cerro Horqueta, 7000 ft, *Blum & Dwyer 2626* (MO). Monte Rey above Boquete, *Croat & Porter 15702* (MO). NW side of Cerro Pando, *Croat 15976* (MO). Between Concepción and El Hato de Volcán, *D'Arcy 4254A* (MO). Bajo Chorro, *Davidson 198* (MO). NW of Boquete, Cerro Horqueta, 5000–5800 ft, *Dwyer et al. 518* (GH, K, MO, NY, UC, US). Boquete, Finca Collins, *Dwyer & Hayden 7653, 7666, 7681* (GH, MO, US). Boquete, Finca Collins, *Dwyer & Hayden 7664* (GH, K, MO, UC, US). Boquete, *Ebinger 671* (MO). Finca Collins, Boquete, *Hayden 162* (MO). Finca Collins, Boquete, 6000 ft, *Kirkbride 120* (MO). 27 km NW of El Hato del Volcán, 500–5300 ft, *Mori & Bolten 7194* (MO). Palo Alto, E of Boquete, 5000 ft, *Stern et al. 1015* (MO). Quebrada Velo, 1800 m, *Woodson & Schery 258* (MO). Bajo Mona & Quebrada Chiquero, *Woodson & Schery 564* (MO). Río Chiriquí Viejo Valley, *White 53* (MO). Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 984* (MO). COCLÉ: Between Cerro Pilón and El Valle, *Duke & Dwyer 13972* (MO).

22. **Hoffmannia pustulata** Dwyer.[63] TYPE: Panamá, *Dressler* May–June 1972 (MO-217890, holotype).

Subshrubs to 0.3 m tall, the stems subprostrate and rooting at the nodes, the bark somewhat rough, the lenticels minute. *Leaves* deciduous, but crowded toward the apex of the twiglets, narrowly obovate oblong, 4.5–8 cm long, 1.6–4.5 cm wide, deltoid to obtuse toward the apex, acute at the base, the costa prominent above and beneath, the lateral veins 22–25, plane above, prominulous beneath, the intervenal areas conspicuously bullate above, stiffly chartaceous, concolorous, ferrugineous villosulose beneath; petioles 0.4–1 cm long, the hairs many, ferrugineous; stipules oblong, ca. 3 mm long, leaf-like. *Inflorescences* axillary, the peduncles 0.5–5 cm long, slender, ca. 1.2 mm wide, the hairs few, the cymules on reduced branches, the flowers few. *Flowers* scarcely pedicellate; calycine cup much reduced, the lobes 4, thickly subulate, to 1.5 mm long, the hairs few, to 0.8

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[63] *Hoffmannia pustulata* Dwyer, spec. nov. *Suffrutices* ad 0.3 m alti, caulibus in parte inferiori subprostratis et in nodis radicibus. *Folia* anguste obovato-oblonga, 4.5–8 cm longa, 1.6–4.5 cm lata, versus apicem deltoidea, venis lateralibus 22–25 interveniis supra conspicue bullatis rigido-chartacea subtus ferrugineo-villosulosa; petiolis 0.4–1 cm longis; stipulis oblongis, hic ca. 3 mm longis, foliosis. *Inflorescentiae* pedunculis 0.5–5 cm longis, gracilibus, cymulis in brevissimis ramis dispositis floribus paucis. *Flores* breviter pedicellati, cupula calycis brevissima dentibus 4 crasso-subulatis, 1.5 mm longis, ciliis paucis, ad 0.8 mm longis, glandulis 2–3 minutis inter dentes dispositis; corolla tubo brevissimo, 1 mm longo, glabro, lobis 4 oblongis, ad 2 mm longis; staminibus 4, antheris oblongis, ca. 2 mm longis, filamentis brevibus, ca. 1 mm longis; stigmatibus, ca. 1.2 mm longis, stylo ad 2 mm longo. *Fructus* immaturi oblongi-rotundi, ca. 5 mm in diam., glabri, raphidibus multis.

mm long, weak, with 2–3 minute glands between adjacent lobes, these 0.1 mm long, red; corolla pinkish green, the tube much reduced, to 1 mm long, glabrous, the lobes 4, petaloid, oblong, to 2 mm long, obtuse, slightly cucullate and carinate, the raphides abundant; stamens 4, the anthers oblong, ca. 2 mm long, obtuse, the filaments short, ca. 1 mm long; stigmas 2, thickly subulate, ca. 1.2 mm long, the style to 2 mm long, thick, the ovules numerous, the ovarian disc pulvinate, to 0.4 mm long, 1 mm wide. *Fruits* (immature), oblong rotund, ca. 5 mm in diam., glabrous, the raphides many.

The new species is known only from Panama. Dressler has supplied important notes concerning the plant: "Shady bank in forest; leaves pink beneath, dark red green above; sepals red, petals pinkish green, anther and stigma cream." The dominance of red and pink in several plant parts is striking. Dressler pressed the plant after cultivating it.

Hoffmannia pustulata is closely related to the recently described *H. bullata* L. O. Williams which also has bullate leaves. The wide-ranging *H. bullata* (Mexico to Costa Rica) has the leaves petiolate and the lateral veins 8–15 pairs, while *H. pustulata* has leaves with petioles to 1 cm long and with 22–25 pairs of lateral veins. The corolla of *H. bullata* is "dull brick red measuring about 10 mm long," while *H. pustulata* has a pinkish green corolla about 3 mm long.

COLÓN: Río Guanche, *Dressler* May–Jun. 1972 (MO).

23. **Hoffmannia rexmontis** Dwyer.[64] TYPE: Panamá, *Croat 15934* (MO, holotype).

Subshrubs 1–1.5 m tall, the stems succulent, olive colored when dry, conspicuously rimose, minutely puberulent, the nodes well spaced; stipular scars conspicuously annular. *Leaves* widely oblong lanceolate, 13–18 cm long, 6–8 cm wide, deltoid and short acuminate at the apex, the acumen to 1.5 cm long, 0.15–0.3 cm wide, the costa plane or ridged above, prominulous beneath, deltoid to obtuse at the base, the lateral veins ca. 14, widely arcuate, the submarginal vein undulate, 0.5 mm from the margin, the intervenal areas spreading reticulate, membranous, concolorous, minutely white farinose on both sides; petioles 6–7 cm long, slender, to 0.15 cm wide; stipules not seen. *Inflorescences* axillary, the peduncle to 1 cm long, 0.1 cm wide, the flowers few, the bracts subulate, to 1.5 mm long. *Flowers* not seen. *Fruits* pedicellate, the pedicels 0.3–10 mm long, the scars of the pedicels rotund, to 2 mm in diam.; fruits elliptic oblong or obovate oblong, to 0.9 cm long, to 0.38 cm wide, often truncate at the apex, attenuate toward the base, more than twice as long as wide, yellow green when dry, glabrous, the ribs 8, slender; persistent calycine cup to 1 mm long, the lobes triangular or subulate, to 1.5 mm long, glabrous.

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[64] *Hoffmannia rexmontis* Dwyer, spec. nov. *Suffrutices* 1–1.5 m alti, caulibus succulentis. *Folia* lato-oblongo-lanceolata, 13–18 cm longa, 6–8 cm lata apice deltoidea, venis lateralibus ca. 14 lato-arcuatis, membranacea utrinque minute-albido-farinosa; petiolis ad 6 cm longa. *Inflorescentiae* pedunculo ad 1 cm longo, floribus paucis; bracteis subulatis ad 1.5 mm longis. *Fructus* pedicellis 0.3–2 mm longis elliptico-oblongi obovato-oblongi, ad 0.9 cm longi, glabri costis gracilibus 8; calycis dentibus, ad 1.5 mm longis.

Hoffmannia rex-montis is known only from Panama. It is distinguished by the fruit drying a dull yellow green and measuring about 2¼ times longer than wide. The fruits in the living state are red, pink or white (fide Croat). The only other species of *Hoffmannia* in Panama with similar fruit measurements is *H. psychotriifolia* (Benth.) Griseb. The pedicels leave a buttonlike scar which is a distinguishing character. The leaves tend to be concolorous on drying, but a few of the dried leaves suggest that they are darker above in the living state.

CHIRIQUÍ: NW side of Cerro Pando, cloud forest, *Croat 15920, 15934* (both MO).

24. **Hoffmannia rubripigmenta** Dwyer, Ann. Missouri Bot. Gard. 56: 283. 1960. TYPE: Panamá, *Duke 10870* (MO, holotype).

Herbs, woody, low growing, the branchlets glabrous, the raphides minute, oblong. *Leaves* obovate elliptic, to 23 cm long, to 9.5 cm wide, widely deltoid at the apex, ultimately obtuse, narrowly cuneate at the base, scarcely decurrent on petiole, the costa prominulous above and beneath, the lateral veins ca. 8, arcuate, the intermediate veins more divergent, ramose and evanescent; petioles to 1 cm long, delicately alate; stipules not seen. *Inflorescences* a little longer than the petioles, peduncle slender erect, glabrous, to 2 cm long, ca. 0.5 mm wide, red when dry, the flowers ca. 8. *Flowers* (in bud) subsessile, narrowly oblong, ca. 1 mm wide; hypanthium oblong, to 2.4 mm long, carnose, the wall thick, to 3.5 mm wide, glabrous, smooth, the teeth erect, triangular, to 1.5 mm long; corolla with the tube presumably short, the lobes 4, glabrous; stamens 4, the anthers ca. 4 mm long, the connective not produced at the apex or base; style cylindrical, the stigmas erect, oblong, ca. 1.3 mm long, scarcely thicker than the style. *Fruits* not seen.

Hoffmannia rubripigmenta is known only from Panama.

DARIÉN: Between upper Río Membrillo and Camp 7 on construction road to San Blas, 100–800 m, *Duke 10870* (MO).

25. **Hoffmannia subauriculata** Standley, J. Wash. Acad. Sci. 18: 179. 1928. TYPE: Costa Rica, *Standley & Rojas 50596* (US, holotype).

Herbs, short, woody, the stems strongly quadrangular, smooth, glabrous, the roots fibrous. *Leaves* sessile, elliptic to obovate elliptic or obovate spatulate, 9–30 cm long, 5–10 cm wide, acute and short acuminate at the apex, basally cuneate, often widely so, to 2.5 cm wide at the base, ultimately obtuse or vaguely auriculate, the costa porcate above, prominent beneath, the lateral veins 10–25, widely arcuate, prominent beneath, usually 1.5–2.5 cm apart, with usually a conspicuous intermediate vein between a pair of lateral veins, chartaceous, glabrous, the raphides numerous, linear; stipules not seen. *Inflorescences* with peduncles wiry but not stiffly erect, arising at or near the ground level, to 4 cm long, the cymules few flowered. *Flowers* (in bud) with the hypanthium glabrous, the calycine teeth 4, subulate, less than 1 mm long, puberulent; stamens and petals not seen; ovary 2-locular. *Fruits* oblong, to 6 mm long, the ribs 4; seeds ca. 1 mm long, coarsely foveolate.

Hoffmannia subauriculata is known from Costa Rica and Panama.

BOCAS DEL TORO: Without other locality, *Wedel 361* (MO). DARIÉN: Cerro Pirre, *Bristan 627* (MO).

26. **Hoffmannia vesciculifera** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 285. 1929. TYPE: Panamá, *Cooper 231* (F).—FIG. 52.

Shrubs to 1.5 m tall, probably unbranched, the hairs densely ferrugineous and arachnoid flocculose. *Leaves* oblong rotund to obovate oblong, to 25 cm long, to 15 cm wide, briefly acuminate at the apex, cuneate to rounded at the base, the costa immersed above, prominulous to plano compressed beneath, the lateral veins 12–25, widely arcuate to substrict, chartaceous, discolorous, drying brown, usually foveolate above, the hairs diffuse, to 5 mm long, often calcified at the base, confined to veins and venules; petioles to 4.5 cm long, conspicuously inflated for most of their length, the inflations to 1 cm wide, located nearer the blade than the node, densely ferrugineous flocculose; stipules not seen. *Inflorescences* to 5 cm long, the peduncles to 2 cm long or absent, the flowers numerous in densely bracteate axillary heads, these rounded or compressed rotund, the bracts linear lanceolate, to 1.5 cm long, 0.3–1.5 mm wide, with 1–2 irregular ascending submarginal veins, the margins glandular pectinate ciliate, the hairs to 4 mm long. *Flowers* yellow; pedicels to 4 mm long, glabrous; hypanthium oblong, truncate, glabrous, delicately 4-ribbed, the calycine lobes 4–5, unequal in length and width, lanceolate, 7.5–10 mm long, tapering above the middle, 1.5–2 mm wide, the hairs ferrugineous, marginal, to 2 mm long, usually densely aggregated above the middle, with a minute gland at junction of adjacent calycine lobes; corolla with the tube cylindrical, to 20 mm long, glabrous, the lobes 4, shorter than the tube, hirsute outside; stamens 4–5, the anthers oblong, ca. 4.5 mm long, the filament ca. 0.3 mm long, the connective not produced at the apex or base, the style slender, the stigmas clavate, spreading at maturity, wider than and about ¼ the length of the style. *Fruits* oblong rotund, to 5 mm long, ca. 4.5 mm wide, delicately ribbed, the ribs ca. 10, the pericarp thin walled, the raphides abundant, the hairs deciduous; the persistent calycine lobes 4, linear lanceolate, to 10 mm long, the hairs deciduous in patches; seeds rectangular to cuneate, coarsely reticulate.

Hoffmannia vesciculifera Standley is known from Costa Rica and Panama.

BOCAS DEL TORO: Cerro Bonyic, above Quebrada Huron, *Kirkbride & Duke 611* (MO). Chiriquí-Calderas Trail, between Quebrada Higueron and Gutierrez, *Kirkbride & Duke 761* (MO). Water Valley, Chiriquí Lagoon, *Wedel 1514* (MO). Fish Creek Mts., Chiriquí Lagoon, *Wedel 2284* (MO). CHIRIQUÍ: Cerro Colorado, 50 km N of San Félix, 1200–1500 m, *Mori & Dressler 7784* (MO). Buena Vista Camp, Chiriquí Trail, 750 m, *G. P. Cooper 231* (F, holotype). Cerro Colorado, upper mining road, 20–28 mi from San Félix, *Croat 33386* (MO). Cerro Colorado, 34.1 km beyond bridge over Río San Félix, *Croat 37307* (MO). COCLÉ: El Valle, *Dressler 4071, 4386* (both MO). Cloud forest of Cerro Caracoral, *Duke & Dwyer 15150* (NY). La Mesa, *Dwyer & Nee 11952* (MO). Cerro Colorado, Bocas Road, 1500 m, *Folsom & Collins 1821* (MO). Cerro Caracoral Gaital, *Kirkbride 1117* (MO). COLÓN: Río Iguanita, 300 m, *D'Arcy 11256* (MO). VERAGUAS: NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, Valley Río Dos Bocas, 450–550 m, *Mori et al. 3810* (MO). 16 km from Santa Fé, Atlantic slope near Río Calovéborita, *Mori et al. 6693* (MO). NW of Santa Fe, 11 km from Escuela Agricola, Alto de Piedra, *Mori et al. 3847* (MO). Guabal, 16 km NW of Santa Fé, 500 m, *Dressler 4796* (MO).

27. **Hoffmannia witheringioides** Dwyer.[65] TYPE: Panamá, *Croat 25551* (MO, holotype).

Subshrubs to 1.5 m tall, the branchlets angular, black brown when dry, pubescent, the hairs dense, curled, the nodes well spaced. *Leaves* ovate, oblong, rotund or oblong rotund, at first seemingly anisophyllous but actually pseudo anisophyllous, the smaller leaves on short axillary branchlets, the blades then to 4 cm long, to 2.3 cm wide, acuminate, the larger leaves to 13 cm long, to 8 cm wide, rounded or obtuse toward the apex, attenuate cuneate toward the base, the costa slender and prominulous above, subprominent beneath, the lateral veins ca. 10, the venules irregular pinnatiform, arcuate, chartaceous, discolorous, dark brown above, liver colored beneath, the hairs on both sides short, vermiform subulate, turgid toward the base, rough to the touch; petioles 3.5–4 cm long, to 1.5 mm wide, with dense, curled hairs; stipules not seen. *Flowers* 1–2 per axil, the peduncle absent, the pedicels to 0.7 cm long, slender with curled hairs; hypanthium turbinate, to 4 mm long, truncate, the hairs curled, lightly costate, the calycine cup 0.5 mm long, the lobes 4, deltoid, to 1 mm long; corolla dark yellow green, the tube cylindrical, to 4 mm long, scarcely expanded near the mouth, petaloid, villose outside, glabrous within, the lobes 4, ovate oblong, to 4 mm long, obtuse; stamens 4, the anthers subsessile, oblong, to 2.2 mm long, the connective to 0.5 mm long at the apex, rounded; style to 5 mm long, the stigmatic lobes oblong, to 1.2 mm long, to 0.5 mm wide, obtuse. *Fruits* not seen.

Hoffmannia witheringioides is known only from the solitary collection in Panama. It bears a striking resemblance to the solanaceous genus *Witheringia*. The pseudo-anisophylly of the species is striking. The reduction of the flowers to one or two, coupled with the absence of a peduncle seems unique for the *Hoffmannia* of Middle America.

VERAGUAS: Río Segundo Braso, 8 km beyond Escuela Agricola Alto Piedra beyond Santa Fé, 750 m, *Croat 25551* (MO).

28. **Hoffmannia woodsonii** Standley, Ann. Missouri Bot. Gard. 28: 471. 1941. TYPE: Panamá, *Woodson & Schery 503* (MO, holotype).

Shrubs 2–4 m tall, the twigs glabrous, smooth, the raphides dot-like white. *Leaves* oblong, 5–12 cm long, 1–5(–6) cm wide, attenuate acuminate at the apex, the acumen to 1 cm long, basally attenuate cuneate or acute, the costa plano compressed beneath, the lateral veins 4–8, prominulous above, subprominent beneath, membranous to thinly chartaceous, glabrous or puberulent, the raphids scattered, white, subgranular above; petioles 2–6 cm long, to 0.8 mm wide; stip-

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[65] *Hoffmannia witheringioides* Dwyer, spec. nov. *Suffrutices* ad 1.5 m alti ciliis densis crispisque. *Folia* ovato-oblongo-rotunda vel oblongo-rotunda primo visa ut anisophylla sed vere pseudo-anisophylla, foliis minoribus in ramulis axillaribus brevibus dispositis, laminis tunc ad 4 cm longis, ad 2.3 cm latis, foliis maioribus ad 13 cm longis, ad 8 cm latis, venis lateralibus circa 10, chartacea discoloria ciliis utrinque brevibus vermiformi-subulatis; petiolis 3.5–4 cm longis. *Flores* 1–2 per axillam, pedunculo nullo, pedicellis ad 0.7 cm longis ciliis crispis ornatis, cupula calycis circa 0.5 mm longa, lobis 4 deltoideis, ad 1 mm longis; corolla tubo ad 4 mm longo, extus villoso intus glabro, lobis 4, ad 4 mm longis; antheris 4, subsessilibus oblongis, ad 2.2 mm longis, apice connectivo ad 0.5 mm longo; stylo ad 5 mm longo, lobis stigmatis oblongis 1.2 mm longis.

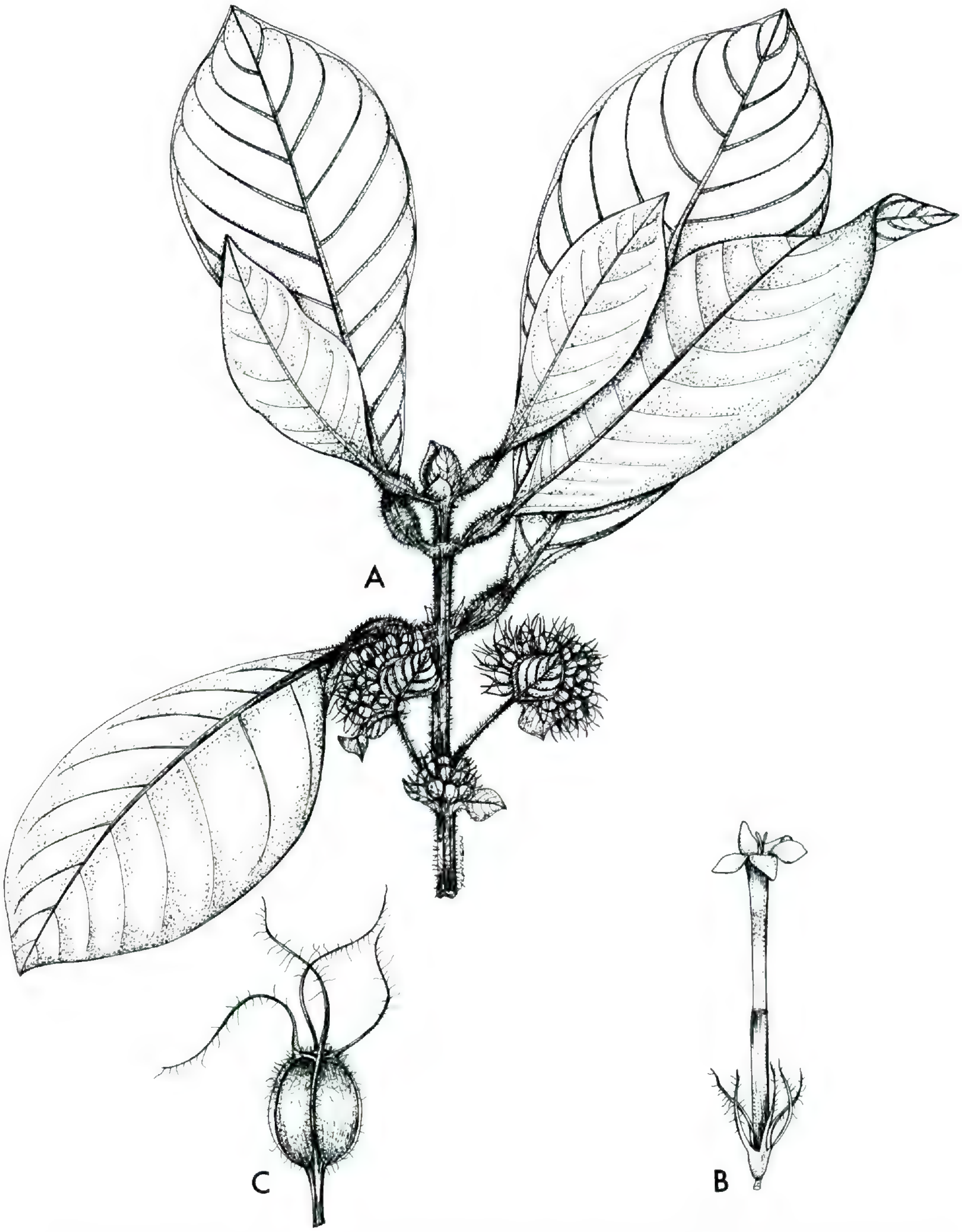

FIGURE 52. *Hoffmannia vesciculifera* Standley.—A. Habit (×½).—B. Flower (×1).—C. Fruit (×2.5). [After *Dressler 4386.*]

ules not seen. *Inflorescences* 1–2 per axil, cymes to 1.5 cm long, the peduncles reduced to a pad or to 6 mm long, ca. 0.5 mm wide, glabrous to ferrugineous puberulent, the flowers usually 2–6 per cymule. *Flowers* with the pedicels 5–7 mm long, often radially disposed or deflexed candelabraform capillaceous, glabrous to ferrugineous puberulent; hypanthium square in cross section; subcarnose, glabrous (puberulent?), the calycine teeth 4(–5), cuneate subulate, 0.5–1.3

mm long; corolla white, cream, yellow, to occasionally whitish pink or orange, 7–8 mm long, the lobes 4, elongate, delicately carnose, glabrous, often delicately ribbed; stamens 4, the anthers partly exserted, 3–4.7 mm long, the connective produced at the apex, the acumen ovate deltoid, ca. 1 mm long; ovary 2-locellate, the style 4–5.5 mm long, the stigmas 2, oblong capitate, 1–1.2 mm long, wider than the style. *Fruits* (not seen in fleshy mature stage) oblong subrotund, truncate, to 4.5 mm long, red; persistent calycine lobes glabrous, delicately ribbed, the ribs well spaced, varying in prominence.

Hoffmannia woodsonii is known only from Panama. Most collections are from above 600 m but a few collections have been made near sea level.

BOCAS DEL TORO: Between Guttierrez Quebrada and E slope of La Zorra, Río Mali, Chiriqui Trail, *Kirkbride & Duke 715* (MO). CANAL ZONE: Farfan Beach, *Dwyer & Lallathin 8791* (MO). Barro Colorado Island, *Croat 10125, 10213, 14567* (all MO). CHIRIQUÍ: Methodist camp, near Nueva Swissa, *Croat 13511* (MO). Between Boquete & Monte Rey, *Croat 15634* (MO). 10–11 mi W of Puerto Armuelles, *Croat 22003* (MO). 6 mi beyond Escuela Agricola Alto Piedra, 730 m, *Croat & Folsom 34024, 34025* (both MO). Road between Alto Piedra School and Río Calovébora, 1.8 mi beyond school, 500 m, *Croat & Folsom 34112* (MO). Cerro Horqueta, *Duke et al. 13634* (MO). 12 mi W of Puerto Armuelles, *Liesner 202* (MO). Dos Lagunas, 4 km W of El Hato del Volcán, 1300 m, *Mori & Bolten 7396* (MO). Quebrada Velo, *Woodson & Schery 260* (MO). Callejón Seco, Volcán de Chiriquí, *Woodson & Schery 503* (MO). COCLÉ: Cerro Pilón, *Dwyer & Lallathin 8659, 8681* (all MO). Cerro Gaital Caracoral, *Dwyer & Correa 8910* (MO). Club Campestre to La Mesa, *Dwyer 10526* (MO). El Valle, *Lewis et al. 1732* (GH, MO, US). Cerro Pilón, 5 km NE of El Valle, *Mori 6560* (MO). Río Guanche, ca. 3–5 km above Portobelo road bridge, *Croat 36998* (MO); COLÓN: *Mori & Kallunki 5189* (MO). Río Guanche, 2.5 km upriver from bridge, road to Portobelo, *Mori et al. 6447* (MO). LOS SANTOS: Loma Prieta, *Duke 11849* (MO). PANAMÁ: Cerro Campana, *Croat 14723, 14783* (both MO). El Llano-Cartí Road, 9.6 km from Panamerican Highway, *Mori & Kallunki 1855* (MO). Cerro Campana, 870–1000 m, *Mori & Kallunki 3564* (MO). 5–10 km NE of Altos de Pacora, 750 m, *Mori & Kallunki 4987* (MO). 16 km N of Panamerican Highway, El Llano-Cartí Road, 400–450 m, *Nee & Dressler 9341* (MO). VERAGUAS: Between Santa Fé and Río Calovébora, 1.8 mi beyond Escuela Agricola, 735 m, *Croat & Folsom 34268* (MO).

49. ISERTIA

Isertia Schreb., Gen. Pl. 1: 342. n. 602. 1789. TYPE: *I. coccinea* (Aubl.) Vahl.

Creatantha Standley, Field Mus. Nat. Hist., Bot. Ser. 8: 344. 1931. TYPE: *C. peruviana* Standley.

Trees or shrubs. *Leaves* petiolate, the stipules free, interpetiolar, erect, persistent. *Inflorescences* large, terminal, cymose corymbose or cymose paniculate. *Flowers* large, pedicellate, the hypanthium usually subovoid, the calycine cup short, the teeth usually 4–6; corolla elongate, tubular funnelform or salverform, rigidly petaloid, hairy within, the lobes 4–6, valvate; stamens exserted, the anthers linear; ovary 2–6-celled. *Fruits* baccate, globose, the seeds small, numerous, foveolate.

Isertia occurs throughout Middle America and tropical South America. There are about 25 species in the genus.

a. Leaf-blades usually dull grey green beneath; lateral veins 15–22; corolla tube to 20 mm long; fruits to 0.7 cm in diam. ..... 1. *I. haenkeana*

aa. Leaf-blades bright gray green, grey or tan beneath when dry, usually described as whitish beneath; lateral veins ca. 22; corolla tube to 50 mm long; fruits 1.5 cm in diam. ..... 2. *I. hypoleuca*

1. **Isertia haenkeana** DC., Prodr. 4: 437. 1830. TYPE: México, *Haenke*, not seen.

I. spicaeformis Hemsl., Biol. Centr. Amer. Bot. 2: 31. 1881, not DC. 1830.

Trees to 6 m tall or *shrubs*, the branchlets angular, usually densely villosulose or villose, the nodes well spaced, often constricted. *Leaves* oblong, widely lanceolate, occasionally obovate oblong, to 46 cm long, to 28 cm wide, cuspidate, the cusp to 2.5 cm long, deltoid to acute at the apex, subobtuse to cuneate at the base, often attenuate, occasionally slightly inequilateral, the costa slender, subimmersed or slightly prominulous above, prominent beneath, especially proximally, the secondary veins 15–22, rigid, ascending, the intervenal areas with perpendicular veinlets, membranous, papyraceous, rarely subcoriaceous, usually dull grey green beneath when dry, glabrous above, appressed villosulose beneath; petioles 0.5–6 cm long, the lamina decurrent adaxially, pubescent; stipules trapeziform or ovate elliptic, to 1.6 cm long, acute, carinate, villose. *Inflorescences* terminal, solitary, puberulent, thrysiform, pyramidal, oblong or subrotund, rarely wider than long, shorter than the terminal leaves, to 21 cm long, to 10 cm wide, the peduncles absent or to 5 cm long, often stout, to 0.6 cm wide, angular, the basal branches usually opposite, the lower branches of epedunculate inflorescences more remote from the upper branches, these appearing whorled, densely flowered. *Flowers* with the hypanthium and calycine cup subrotund, ca. 4 mm diam., to 2 mm long, sparsely pubescent outside, but with patches of glands at or near the apex of the cup within, the teeth 4–5, scarcely evident; corolla yellow, the tube narrowly cylindrical, ca. 20 mm long, glabrous outside, pubescent above the middle within, the lobes ca. 6 mm long, slightly cucullate, about ⅓ the length of the tube or less, golden villose within; stamens 5, the anthers oblong, ca. 3.5 mm long, acute at the apex, the filaments crassate, about as long as the anther, attached near the corolla mouth; ovarian disc prominent, padlike, the style linear, ca. 25 mm long, the stigmas 5, linear oblong, ca. 5 mm long. *Fruits* depressed rotund, to 7 mm in diam., glabrous to puberulent; seeds brown, to 1 mm long, favose.

Isertia haenkeana occurs in Central America, extending into Colombia and Venezuela. It also occurs in Cuba. "Canelito," "Fruta de Mono," "Huevo de Mono," "Murcielago," Pansus Tumatti" (San Blas).

BOCAS DEL TORO: Almirante, *Blum 1388* (MO); *McDaniel 5049* (MO). Chiriquí Lagoon, *Seibert 1546* (US). Little Bocas, *Wedel 2488* (MO, US), *2539* (MO). Santa Catalina, *Blackwell et al. 2703* (MO, UC). CANAL ZONE: Madden Dam Road, *Bartlett & Lasser 16442* (MO). Summit Gardens, *Croat 14980* (MO). Pipeline Road within 5 mi of Gamboa Gate, *D'Arcy 9275* (MO). Drowned Río Azote Caballo, *Dodge et al. 16842* (MO). Fort Kobbe, *Duke 3929* (MO). Between Puentos de Las Americas & Fort Kobbe, *Duke & Mussell 6552* (MO). George Greene Memorial, *Dwyer 6756* (MO). Miraflores Locks, *Dwyer & Robyns 2* (MO). Albrook, U.S. Army Tropic Test Site, *Dwyer & Robyns 52* (MO). Chagres, *Fendler 43* (MO). Road to Corozal, *Gervais 129* (F). Ancón, *Gervais 149* (US). Mount Hope, *Johansen 57* (MO). K-10 & K-15 Road, *Luteyn 1584* (MO). Headwater Río Providencia, 7.5 km SW of Gatún Locks, *Nee & Gentry 8678* (MO). Miraflores & Corozal, *Pittier 2199* (US). Gamboa, *Pittier 3786* (US). Agua Clara, *Pittier 5931* (US). Ancón Hill, *Seibert 389* (F, MO). Road K-15, *Smith et al. 3285* (F). Pipeline Road, *Smith & Smith 3303* (F). Corozal Road, *Standley 26832* (US). Summit, *Standley 26940* (MO). Balboa, *Standley 27011* (US). Río Tapia, *Standley 28111* (US). Fort Randolph, *Standley 28605* (US). Balboa, *Standley 29570* (US). Summit, *Standley 29640* (US). France Field, *Standley 30340* (US). France Field, *Standley 30426* (US). Cerro Luisa, above Pedro Miguel Locks, *Stern & Chambers 2* (MO). Fort Sherman, *Stimson 5100* (MO, US). Albrook, *Stimson 5062* (MO).

Miraflores Locks area, *Tyson 1144* (MO). Gamboa Pipeline Road, *Tyson 1488* (MO). Beacon Hill, Albrook Air Force Base, *Tyson 2040* (MO, US). Farfan Beach, *White 141* (F, MO). Summit Garden, *Witherspoon & Witherspoon 8692* (MO). Ancón Hill, *Woodson et al. 1333* (F, MO). BARRO COLORADO ISLAND: *Aviles 29* (F, MO); *Bangham 370* (US); *Brown 73* (F); *Croat 4055, 4063, 5076, 6107, 6331, 7050, 11611* (all MO); *Dodge 3466* (US); *Dwyer 8475* (MO); *Hayden 23* (MO); *Kenoyer 548* (US); *Luteyn 781* (F); *Shattuck 625* (F, MO), *765* (F); *Standley 41056* (US); *Starry 133* (F, MO); *Woodson & Schery 964* (F, MO); *Woodworth & Vestal 352* (MO). COCLÉ: Cerro Pilón, *Duke 12177* (MO). El Valle, *Wilbur 11140* (F). COLÓN: Camp Piña, *Allen 3589* (F). Nuevo Limón, *Allen 5141* (F). Guasimo on Río Miguel de la Borda, *Croat 9997* (MO). Sabanita, *Croat 11072* (MO). Santa Rita Ridge, *Croat 13175* (F). Ocean Trail between Río Indio and Miguel de la Borda, *Croat 36923* (MO). Río Guanche near Coastal Highway, *D'Arcy 10207* (MO). Road to Portobelo between Río Piedras & Portobelo, *Elias & Kirkbride 1638* (GH, MO, UC, US). Piña, *Kirkbride & Hayden 316* (MO). 6 mi SW Portobelo, *Luteyn 1420* (MO). Santa Rita Ridge, *Lewis et al. 5254* (MO, MOCZ, US). 7 km NE of Puerto Pilón, road to Portobelo, *Nee 6680* (MO). 3–4 km NW of Salamanca, 13 km NE of Buenos Aires, *Nee 9097* (MO). Santa Rita Hills, *Smith & Smith 3441* (F). DARIÉN: Pinogana to Yaviza, *Duke 5166* (MO). Río Tuira between Pucro & Río Ponusa, *Duke 5388* (MO). S of El Real on Río Pirre, *Duke 5418* (MO). Caná, *Stern et al. 653* (MO). Tucutí, *Terry & Terry 1404* (F, MO). Caná, *Williams 754* (US). PANAMÁ: Pacora, *Allen 1121* (F, US). Without exact locality, *Andersson* (F). Burunga, *Austin 14* (MO). Campana, *Castillo 27* (MO). San José Island, *Correa 89* (MO). El Llano-Cartí Road, ca. 10 km N of Panamerican Highway, *D'Arcy 10660* (MO). 5–6 mi E of Chepo, *Duke 4050* (MO). Between El Llano and Río Mamoní, *Duke 5606* (MO). San José Island, *Duke 12544* (MO); *Erlanson 264, 306* (both US). Arraijan, *Guerra 8* (MO). Capira, *Jaramillo 36* (MO). San José Island, *Johnston 77* (US). Chimán, *Lewis et al. 3241* (MO). Capira, *Maurice 803* (MO). 6 km SW Arraijan, road to Bique, *Nee 6903* (MO). Capira, *Paul 135* (US). Las Sabanas, *Pittier 6705* (US). Juan Franco Race Track, *Standley 27741* (US). Tumba Muerta Road, *Standley 29753* (US). San José Island, *Stimson* (MO). Arraijan, *Woodson et al. 1366* (F, MO). SAN BLAS: Permé, *Cooper 653* (F, US). Ustupo, *D'Arcy 9500* (MO). Mulatupu (Río Ibedî), *Duke 8485* (MO). Isla de Piñas, *Kirkbride 214* (MO). Achituppu, *Lewis et al. 118* (MO). Ailigandí, *Lewis et al. 138* (GH, MO, UC, US). Niatuppu, *Stier 201* (MO). VERAGUAS: Río Concepción, *Lewis et al. 2788* (COL, DUKE, MO, UC, VEN).

2. **Isertia hypoleuca** Benth., Hook. L. Jour. Bot. 3: 220. 1841. TYPE: British Guiana, *Schomburghk 281* (K, not seen).

I. coccinea var. *hypoleuca* (Benth.) Schum. in Mart., Fl. Bras. 6(6): 286. 1889.
Cassupa panamensis Standley, Contr. U.S. Natl. Herb. 18: 135. 1914. TYPE: Panamá, *Pittier 3889* (US).
Isertia panamensis (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 8: 346. 1931.

Trees to 20 m tall, the branches stout, grooved, densely puberulent. *Leaves* oblong, to 40 cm long, to 27 cm wide, deltoid at the apex, shortly cuspidate, the cusp slender, to 2.5 cm long, often falcate, obtuse, deltoid to cuneate at the base, the costa subplane to prominulous above, slender, prominent, especially proximally beneath, the secondary veins ca. 22, strict, subcoriaceous, discolorous, usually chocolate brown above, grey green, drying grey or tan brown beneath, glabrate above except puberulent on the costa and the veins, densely puberulent beneath; petioles to 0.9 cm long, to 0.4 cm wide, stout, often curved, puberulent, delicately winged on the adaxial side; stipules oblong lanceolate, 1–2 cm long, acute, coriaceous, pubescent marginally. *Inflorescences* terminal, solitary, puberulent, shorter than or as long as the terminal leaves, to 35 cm long, to 15 cm wide, oblong, ovate or subrotund in outline, thyrsiform; peduncles stout, to 7(–8?) cm long, to 0.7 cm wide, lignose, angular, the branches alternate or subverticillate except the lowermost which are often disposed as 2 opposite pairs, stiff, well spaced; bracts and bracteoles minute, widely subulate. *Flowers* sessile or conspicuously pedicellate; hypanthium oblong, truncate, 2.0–3.5 mm long, coriaceous, glabrous, marcescent, the teeth scarcely evident or absent, with small patches of obtuse glands within the cup, corolla white, turning brown to red, the

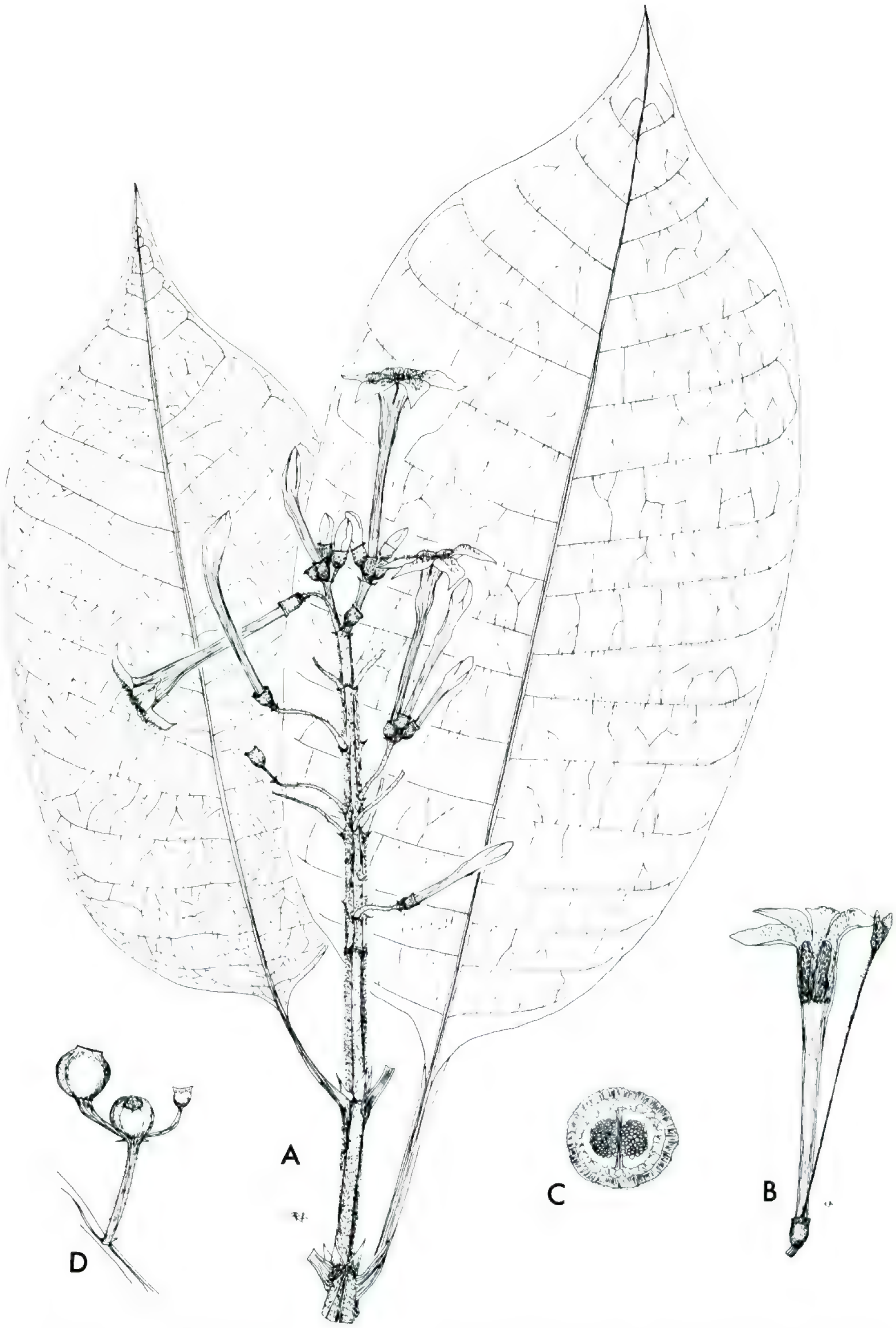

FIGURE 53. *Isertia hypoleuca* Benth.—A. Habit (×½).—B. Flower opened to show interior (×¾).—C. Ovary cross section (×3½). [After *Stimson & Gallegos 5254*.]—D. Fruit (×½). [After *Croat 16756*.]

tube narrow cylindrical, to 50 mm long, 2.0–3.5 mm wide at the middle, puberulent outside, densely villose within above the middle, coriaceous, the lobes 5, oblong, 9–15 mm long, cucullate, subcoriaceous, villose within below the middle; stamens 6, the anthers oblong, ca. 7.5 mm long, acute, minutely apiculate, dorsifixed, the surface honeycomb-like, the filaments short, attached a few mm below the mouth; style linear, 25–27 mm long, ca. 0.7 mm wide, ciliolate at the apex; the stigmas 2, erect, oblong, ca. 5.5 mm long, 1.8–2.5 mm wide, the ovary oblong rotund in cross section, the wall thick, replete with reddish glands, the septum thick, 2-loculate, the placentas T-shaped, crassate, the ovules minute. *Fruits* rotund or oblong, to 1.5 cm in diam., smooth, glabrescent, drying black.

The species is known from Panama, Colombia, Surinam, French Guiana, British Guiana, Venezuela, and Brazil.

BOCAS DEL TORO: Chiriquicito, *Lewis et al. 2054* (GH, MO, US). Nances Cay Island, *Wedel 580* (MO). Old Bank Island, *Wedel 1937* (MO, US). CANAL ZONE: Pipeline Road, *Folsom 2848* (MO). Río Piña-Río Media Divide, *Johnston 1603* (MO). COCLÉ: La Mesa, *Gentry 6845* (MO). Above El Valle, Road to La Mesa, 2500 ft, *Tyson 6930* (MO). COLÓN: Río Piedras, road to Puerto Pilón, *Correa 143* (MO). Guasimo, *Croat 9929* (MO). 1 mi N of María Chiquita, *Croat 11368* (MO). Santa Rita Ridge, *Croat 13175* (MO). María Chiquita, *Dwyer & Kirkbride 7801A* (MO), *7812* (GH, MO, US). Santa Rita Ridge, *Gentry 1856* (MO). Gatún, *Lao 127* (MO). Between Piña and Gatún, *Luteyn 1309* (MO). Santa Rita Ridge, *Stimson & Gallegos 5254* (MO). Achiote, *Tyson et al. 4551* (MO). DARIÉN: Quebrada Venado and Peje Swamp, *Bristan 1056* (MO). Cerro Pirre, *Bristan 1228* (MO, US). Río Paya, *Duke & Kirkbride 14069* (MO). Puerto St. Dorothea, *Dwyer 2201* (MO). PANAMÁ: Cerro Jefe, *Duke 9393* (MO). Cerro Jefe and La Eneida, *Dwyer 8213* (MO). Capira, *Bro. Maurice 803* (US). Cerro Azul, *Tyson 2196, 4051* (both MO). Cerro Jefe, *Tyson 3330* (MO). SAN BLAS: Puerto Obaldía, *Croat 16756* (MO). VERAGUAS: Cerro Tute, *Gentry 6218* (MO). COLOMBIA: CHOCO: Río Mutata, Río El Valle, base of Alto De Buey, 100–150 m, *Gentry & Fallen 17303* (MO).

Index of Latin Names

Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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THE BOTANY AND NATURAL HISTORY OF PANAMA

A symposium to signal completion of the Flora of Panama will be held in Panama 14–17 April 1980. Sessions will include the physical setting, archaeology, vegetation, flora, fauna and demography of Panama and nearby countries as well as other natural history related topics. Conservation of endangered landscapes will be a theme. Both invited and contributed papers will be given, and either Spanish or English may be used. Limited funds may be available to assist costs of attending this meeting. The symposium is sponsored jointly by the Missouri Botanical Garden, the University of Panama, and the Smithsonian Tropical Research Institute.

Contact: Prof. Mireya D. Correa A.
Escuela de Ciencias Naturales y Farmácia
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VOLUME 67 1980 NUMBER 2

FLORA OF PANAMA

BY ROBERT E. WOODSON, JR., AND ROBERT W. SCHERY
and Collaborators

Part IX

FAMILY 179. RUBIACEAE—PART II†

JOHN D. DWYER‡

49. IXORA

Ixora L., Sp. Pl. 110. 1753; Gen. Pl., ed. 5. 48. 1754. TYPE: *I. coccinea* L.

Sideroxyloides Jacq., Sel. Stirp. Amer. 19. 1763. TYPE: *S. ferreum* Jacq.
Siderodendron Schreb., Gen. Pl. 1: 71. 1789. TYPE: *S. floribundum* A. Rich.

Trees or shrubs. *Leaves* occasionally ternate, usually thick; petioles occasionally wanting; stipules free, usually acuminate. *Inflorescences* terminal or axillary, corymbose, the pedicels of the flowers bracteolate. *Flowers* variously colored, the hypanthium ovoid, the calycine cup 4(–5)-lobed; corolla salverform, slender, the lobes 4–5, contorted; stamens 4(–5), the anthers linear, dorsifixed, exserted; ovarian disc swollen, the style slender, the stigmas 2, exserted, the ovary 2-celled, the ovules solitary, peltately attached to the middle of the septum. *Fruits* baccate, leathery or fleshy; seeds concave convex, the testa membranous.

Ixora, a genus of about 400 species, is widely distributed throughout the tropics of the world.

a. Inflorescences capitate; corolla tube 30–45 mm long.
  b. Leaves sessile or subsessile; corolla red or orange ..... 1. *I. coccinea*
  bb. Leaves obviously petiolate; corolla white ..... 2. *I. findlaysoniana*

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† Part I appeared in Volume 67(1) of the *Annals of the Missouri Botanical Garden*.

‡ Missouri Botanical Garden, Box 299, St. Louis, Missouri 63166, and St. Louis University, 221 North Grand, St. Louis, Missouri 63103.

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aa. Inflorescence cymose paniculate, spreading; corolla tube 3–5 mm long.
  c. Leaves 16–24 cm long; peduncles ca. 2.2 cm long; flowers sessile or subsessile; fruits ca. 1 cm in diam. ---------- 3. *I. floribunda*
  cc. Leaves 7–16 cm long; peduncles 5–9 cm long; flowers with pedicels to 5 mm long; fruits ca. 0.4 cm in diam. ---------- 4. *I. nicaraguensis*

1. **Ixora coccinea** L., Sp. Pl. 110. 1753. TYPE: ?Ceylon, herb. Linn. (LINN 131.1, not seen, microfiche MO).

Shrubs 0.5–2.0 m tall, much branching, the twiglets glabrous, the nodes well spaced. *Leaves* sessile or subsessile, oblong, ovate oblong, elliptic or occasionally obovate oblong, 2.0–8.5(–16.0) cm long, 1.2–6.2 cm wide, rounded, deltoid to subacute at the apex, often with a terminal bristle to 1 mm long, cordate, obtuse, basally truncate or subobtuse, the lateral veins 10–13, joining to form an irregular, undulate submarginal vein, the intervenal areas spreading reticulate, coriaceous, glabrous; stipules oblong, to 6.5 cm long, usually shorter, the median awn as long as the body. *Inflorescences* terminal, the flowers in dense corymbs, the aggregate to 7 cm long, occasionally wider than long, the peduncle usually suppressed or to 1.2 cm long, occasionally with 1–2 pairs of opposite branches, the lowermost to 2 cm long; bracts and bracteoles ovate, to 0.8 cm long, acute. *Flowers* sessile; hypanthium subrotund to oblong rotund or turbinate, glabrescent, the calycine cup reduced, the lobes 5, ascending, triangular, ca. 1 mm long, acute; corolla red or orange, the tube linear infundibuliform, 3.5–4.5 cm long, 0.1 cm wide, glabrous or minutely puberulent, the lobes ovate oblong or oblong, 1.2–1.5 cm long, 0.8 mm wide, acute to widely deltoid, glabrous; stamens 4, the anthers soon deciduous, narrowly ovate oblong, 3.5–4.2 mm long, caudate acuminate for ca. 1 mm, sagittate basally, the filaments shorter than the anthers, attached at the mouth; style scarcely exserted or exserted for 5 mm, the stigmas 1 mm long. *Fruits* not seen.

Ixora coccinea is native to Asia. It is commonly cultivated in Central and South America, in the West Indies and in Madagascar. The inflorescence is usually spreading and the peduncle is obvious. *Croat 15624* notes: "fruits red to dark violet, mesocarp sweet, pulpy; seeds 2." One collection, *Correa 1142*, has large leaves reaching to 16 cm in length and distinctly petiolate. "Buquet de Novia"; "Cacho de Toro"; "Jazmin de Coral."

BOCAS DEL TORO: Bocas, airport runway, *Lazor et al. 2430* (MO). CANAL ZONE: Diablo Heights, *Correa 1140, 1142* (both MO). Frijoles, *Ebinger 311* (MO). Coco Solo, *Gentry 6063* (MO). Gaillard Highway between Summit Garden and Gamboa, *Sullivan 21* (MO). Miraflores Locks, *Tyson 1138* (MO). Fort Sherman, *Tyson & Blum 3788* (MO). BARRO COLORADO ISLAND: *Croat 4061 A, 7051, 15264* (all MO); *Hayden 15264* (MO); *Lourteig et al. 3027* (MO). COCLÉ: Penonomé, *Quiros 5* (MO). Turnoff from main highway to Cerro Azul, *Reece 1* (MO). DARIÉN: El Real, *Lazor & Correa 3368* (MO). PANAMÁ: Juan Diaz, *Mendez s.n.* (MO).

2. **Ixora findlaysoniana** Wall. ex G. Don, Gen. Syst. 3: 572, 1834. TYPE: not seen.

Shrubs or trees, to 4.5 m tall, the twigs terete, smooth, glabrous, ultimately angular, the pith porate, the nodes 1.5–5.0 cm apart. *Leaves* narrowly obovate to oblong, occasionally subfalcate, 7–18 cm long, 2.5–6.5 cm wide, obtuse to cuneate at the apex, occasionally rounded, basally cuneate, often attenuate acute,

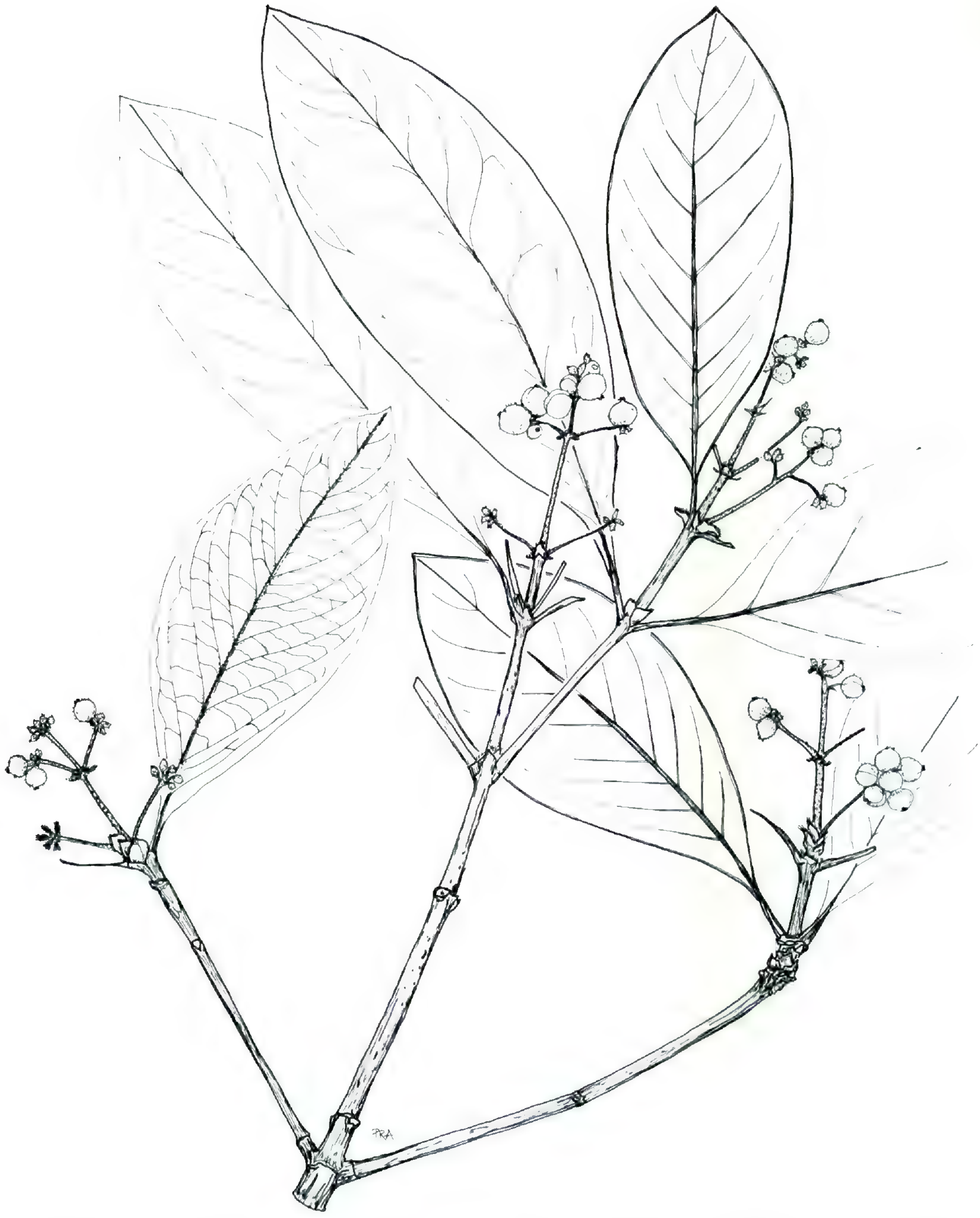

FIGURE 54. *Ixora floribunda* (A. Rich.) Griseb. Habit (×½). [After *Dwyer & Robyns 35.*]

the costa prominulous or immersed above, subprominent beneath, especially proximally, the lateral veins ca. 9, arcuate, thinly coriaceous, concolorous, glabrous; petioles to 2 cm long, 0.10–0.22 cm wide; stipules free or occasionally connate, oblong or hemispherical, 0.4–0.7 mm long, with 1–2 subulate awns longer than the body, arising from 1–3 scarcely elevated longitudinal ridges on the body. *Inflorescences* terminal, capitate, to 4.5 cm long, ca. 9 cm wide, rounded. *Flowers* glabrous; hypanthium short, the calycine cup ca. 0.5 mm long, eglan-

dular, the calycine lobes foliaceous, widely elliptic, to 3.5 mm long, to 2 mm wide, acute, thickly petaloid; corolla white, the tube narrowly cylindrical, to 32 mm long, 1 mm wide, petaloid, the lobes 4, spreading or reflexed, oblong, 8 mm long, to 3 mm wide; stamens 5, exserted, the anthers linear ovate, 1.8 mm long, acuminate at the apex, sagittate at the base, the filaments short, attached at the mouth; ovarian disc doughnut shaped, compressed, the style linear, as long as the corolla tube, the stigmas narrowly oblong, to 2 mm long. *Fruits* not seen.

Ixora findlaysoniana is widely cultivated in the tropics; it is probably native to Southeast Asia. "Lila."

CANAL ZONE: Summit Gardens, *Nee 10859* (MO). PANAMÁ: Arraijan, *Carrasquilla & Rincon 295* (MO). Paitilla, *Correa 40* (MO). SAN BLAS: Trail to inland village of Armila, 3–8 km SW of Puerto Obaldía, *Mori et al. 6805* (MO). Niatuppu, *Stier 222* (MO). VERAGUAS: San Francisco, *Dwyer 1299* (MO).

3. **Ixora floribunda** (A. Rich.) Griseb., Cat. Pl. Cub. 134. 1866.—FIG. 54.

Siderodendron floribundum A. Rich. in Sagra, Hist. Cuba 11: 24. 1850. TYPE: Cuba, *Richard* (?P, not seen).

Small *trees*, to 5 m tall, the twigs terete, smooth, glabrous, the nodes well spaced. *Leaves* oblong or obovate oblong, 16–24 cm long, 7–10 cm wide, widely cuneate to subobtuse at the apex, acuminate, the acumen to 1.5 cm long, ultimately acute or obtuse, attenuate acute to somewhat rounded at the base, the costa slender, immersed, plane or somewhat prominulous above, proximally prominent beneath, the lateral veins 9–13, arcuate, thinly coriaceous, concolorous, glabrous; petioles stout, often curved, to 2.5 cm long, to 0.25 cm wide in the middle with a delicate adaxial wing, glabrous; stipules deltoid, to 5 mm long, ca. 1 mm wide at the base, acute, stiffly scarious, rugulose, densely villose on the margin and within, otherwise glabrous. *Inflorescences* terminal, pyramidal paniculate, shorter than the terminal leaves, epedunculate or with peduncles to 2.2 cm long, angular, pubescent, the branches disposed as 2–3 pairs, to 2 cm long, the flowers aggregated into subrotund cymules, ca. 1 cm in diam. *Flowers* sessile or shortly pedicellate; hypanthium subrotund, ca. 1 mm long, villosulose, with numerous oblong glands within, ca. 0.1 mm long, the lobes 5, oblong, obtuse, ca. 0.5 mm long; corolla white, the tube narrowly cylindrical, ca. 4 mm long, ca. 0.7 mm wide, glabrous outside, densely white villose within, the lobes 4, oblong, ca. 4 mm long, concave, ca. 1.5 mm wide, petaloid, glabrous; stamens 5, the anthers narrowly oblong, ca. 3.3 mm long, dorsifixed, the filaments plane, 0.6–1.5 mm long; stigmas 2, unequal, oblong, connate, ca. 1.5 mm long, the ovary oblong in cross section, the wall thick, the septum thick, the ovules several. *Fruits* sessile, rotund, ca. 1 cm in diam., the persistent calycine tube ca. 0.5 mm long, drying red, smooth, sparsely villose.

Ixora floribunda occurs in Salvador, Nicaragua, Costa Rica, Panama, and Colombia, and the Antilles. The stipules of the type of *Siderodendron floribundum* A. Rich. are described as "obtussimis," which does not agree with my description of the stipules as "acute." "Cacho de Toro" (*Holdridge 6219*).

CANAL ZONE: Albrook Site, U.S. Army Tropic Test Center Site, *Dwyer & Robyns 35* (MO). DARIÉN: Between Pinogana and Yaviza, *Allen 298* (MO). Los SANTOS: Coabal, Progreso, W slope above Río Cobachén, *Holdridge 6219* (MO). PANAMÁ: Pacora, *Paul 785* (MO).

4. **Ixora nicaraguensis** Standley, Wernham, J. Bot. 50: 243. 1912. TYPE: Nicaragua, *Seemann 117* (?BM, not seen).

I. rauwolfioides Standley, Trop. Woods 11: 25. 1927. TYPE: Panama, *Cooper & Slater 93* (US, holotype).

Shrubs or trees, to 7.5 m tall, the twiglets drying grey, smooth, glabrous, somewhat twisted. *Leaves* elliptic, oblong or oblanceolate, 7–16 cm long, 2–7 cm wide, short to long acuminate at the apex, acute at the base, the lateral veins 10–15, slender, arcuate, prominulous, the intervenal areas spreading reticulate, chartaceous, discolorous, glabrous; petioles 0.4–1.0 cm long; stipules free, triangular, 0.5–0.8 cm long, acuminate to caudate acuminate at the apex. *Inflorescences* cymose paniculate, spreading, sessile or pedunculate, the peduncles 5–9 cm long, the branches paired, few, well spaced, many flowered; pedicels to 5 mm long. *Flowers* with the hypanthium turbinate, ca. 1 mm long, puberulent, the calycine cup 0.5 mm long, stiffly carnose, rubescent, glabrous, eglandular within, the teeth absent or scarcely developed; corolla white, the tube cylindrical, 3–5 mm long, glabrous outside, glabrous within except villose at the mouth, the lobes 4, oblong, 3–4 mm long, rounded, rubescent, subcarnose; anthers 4, narrowly ovate oblong, 3 mm long, acuminate, the acumen petaloid, the filaments 1 mm long; ovarian disc ca. 0.3 mm long, the style linear, 3 mm long, the stigmas oblong, ca. 1.5 mm long. *Fruits* pink, rotund to oblong rotund, to 4 mm in diam., smooth, glabrous.

Ixora nicaraguensis extends from Belize to Panama.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 93* (US). CHIRIQUÍ: Puerto Armuelles, *Woodson & Schery 851* (MO). San Bartolomé, Burica Peninsula, *Woodson & Schery 851* (MO). San Bartolomé, Burica Peninsula, *Woodson & Schery 880* (MO). DARIÉN: Río Urucea, *Bristan 1451* (MO).

50. JOOSIA

Joosia Karst., Fl. Colomb. 1: 9. *Tab. 5.* 1858. TYPE: Colombia, *J. umbellifera* Karst.

Trees or shrubs. *Leaves* usually elliptic or oblong, acute to long acuminate at the apex, tapering basally; petioles short; stipules deciduous except usually persistent at the tips of the twigs, elongate, free. *Inflorescences* terminal, cymose umbellate, the flowers secundly disposed. *Flowers* with the hypanthium short, the calycine cup and teeth short; corolla white, the lobes valvate, ovate, bifid at the apex, the margins conspicuously scalloped; stamens with anthers often sessile, attached below the middle of tube; ovary 2-celled, the ovules numerous, the placenta adnate to the middle of the septum. *Fruits* capsular, linear or narrowly oblong, splitting into 4 spirally coiled valves; seeds imbricate, membranous, winged, the wing usually bifid at the base, entire or dentate at the apex.

Joosia, a genus of 4 species, is known from Panama, Colombia, and Peru.

1. **Joosia panamensis** Dwyer.[66] TYPE: Panamá, *Croat 25932* (MO).—FIG. 55.

Shrubs or small trees, the branchlets glabrescent, often covered with mosses. *Leaves* elliptic or rarely obovate trapeziform, 16–22 cm long, 6–9.5 cm wide, acute or widely deltoid toward the apex, cuneate or acute at the base, slightly inequilateral, the costa prominulous above, prominent beneath, the lateral veins 10–15, arcuate, the veinlets dense, arising at right angles from the costa, stiffly chartaceous, glabrescent above, beneath with white, appressed hairs; petioles to 1.5 cm long, villose; stipules free, ovate oblong, ca. 2 cm long, ca. 0.5 cm wide at the base, obtuse, red when dry, the hairs few, white. *Inflorescences* terminal, perhaps solitary, cymose umbellate, the peduncle, rigid, slender, to 8 cm long, ca. 0.15 cm wide, often twisted, densely pubescent, the flowers secundly disposed and crowded on short branches arising radiately from the apex of the peduncle; pedicels ca. 2 mm long. *Flowers* with the calyx cup ca. 2.5 mm long, ca. 3 mm wide, cup shaped, expanded, densely ciliolate outside, glabrous within, the lobes 4, oblong, ca. 2 mm long, to 1.5 mm wide, rounded at the apex, glabrous within; corolla white, the tube narrowly cylindrical, ca. 9 mm long, ca. 1.8 mm wide, carnose, the hairs outside appressed, minute, glabrous within, the lobes 5, ovate oblong, to 3 mm long, with 2 ovate elliptic appendages within, to 2.8 mm long, petaloid, glabrous, scalloped; anthers 5, sessile or subsessile or filaments to 2.5 mm long, narrow oblong, ca. 3.5 mm long, attached to the tube at or below the middle, often near the base; style (2–)4–10 mm long, the stigmas 2, unequal, scarcely wider than the style, to 2 mm long. *Fruits* linear oblong, to 2 cm long, to 0.35 cm wide, terete, scarcely angular, the ribs few, prominulous, minutely glandular punctate; seeds spindle shaped ca. 6 mm long, the wing bifid or erosulose at the base, acute, entire or fimbriate at the apex.

Joosia panamensis is known only from Panama. It is related to *J. umbellifera* Karst., a well-known Colombian species. It differs in having much shorter fruits, which measure only about a ⅓ as long as those of *J. umbellifera*, much shorter seeds, and presumably shorter stipules.

BOCAS DEL TORO: Chiriquí Trail between Buena Vista Coffee Finca & Cerro Pilón, *Kirkbride & Duke 680* (MO). COCLÉ: Alto Calvario around Rivera sawmill, 7 km N of El Copé, 700–900 m, *Folsom 3240* (MO). COLÓN: 2–3 mi up Río Guanche, *Kennedy & Foster 2136* (MO). PANAMÁ: 16–20 km above Panamerican Highway road from El Llano to Cartí-Tupile, 400 m, *Kennedy 2694* (MO). El Llano-Cartí Road, 18 km from Panamerican Highway, *Mori et al. 4592* (MO). VERAGUAS: Road between Escuela Agricola Alto de Piedra above Santa Fé and Río Dos Bocas, 730–770 m, *Croat 25932* (MO). Valley of Río Dos Bocas between Alto Piedra and Calovébora, 350–400 m, *Croat 27471* (MO). Caribbean slope above Río Primero Brazo, 5 mi NW of Santa Fé, *Liesner 1014* (MO). 8.8 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3220, 3239* (both MO). 16 km from Santa Fé, near Rio Caloveborita, *Mori 6688* (MO).

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[66] *Joosia panamensis* Dwyer, spec. nov. *Frutices* vel arbores parvae. *Folia* elliptica vel interdum obovato-trapeziformia, 16–22 cm longa, 6–9.5 cm lata, venis lateralibus 10–15, arcuatis; petiolis ad 1.5 cm longis; stipulis ovato-oblongis, ad 2 cm longis. *Inflorescentiae* terminales cymoso-umbellatae, pedunculo ad 8 cm longo, floribus in ramis brevibus secundatim dispositis, ramis radiate dispositis. *Flores* pedicellati, pedicellis ad 2 mm longis, cupula calycis ca. 2.5 mm longa, extus dense ciliolata, lobis 4, ca. 2 mm longis; corolla alba, tubo ca. 9 mm longo, extus pubescente, lobis 5, ovato-oblongis, ad 3 mm longis, ad marginem fimbriatis; stamina 5, antheris sessilibus vel subsessilibus, angusto-oblongis, ca. 3.5 mm longis, infra medium tubi affixis. *Fructus* lineari-oblongi, ad 2 cm longi, teretes, costis paucis prominulis; seminibus ellipticis, ad 6 mm longis.

FIGURE 55. *Joosia panamensis* Dwyer.—A. Habit (×½).—B. Flower opened to show interior (×2).—C. Ovary longitudinal section (×5). [After *Kennedy & Foster 2136.*]

51. LADENBERGIA

Ladenbergia Klotzsch in Hayne, Arzn. Gew. 14: *pl. 15.* 1846. LECTOTYPE: *L. dichotoma* Klotzsch.

Cascarilla Wedd., Ann. Sci. Nat. Bot. Sér. 3. 10: 10. 1848, not *Cascarella* Adanson, 1763, not *Cascarilla* Raf. 1838. LECTOTYPE: not selected.

Trees or shrubs. *Leaves* opposite, occasionally verticillate, coriaceous, petiolate; stipules large, often deciduous, glandular within at the base. *Inflorescences* terminal, paniculate. *Flowers* with the hypanthium ovoid or turbinate, the calycine cup cupuliform, corolla with the tube somewhat funnelform or salverform, replete with fibers, glabrous within, the lobes 5, valvate, papillose within and on the margins; stamens 5, the anthers linear, included, dorsifixed; ovarian disc pulvinate, the ovary 2-celled, the style slender, the stigmatic lobes 2, included, slender, the placentas adnate to the septum, the ovules numerous. *Fruits* capsular, narrowly clavate or cylindrical, septicidally bivalvate from the apex to the base; seeds numerous, imbricate, peltate, the body oblong, surrounded by a membranous, dentate or laciniate wing.

Ladenbergia is known from Costa Rica, Panama, and tropical South America. It is a genus of about 30 species.

Mori & Dressler 7850 (MO) is probably a new species but has only immature leaves. It is the only material seen from the Province of Chiriqui although *Ladenbergia* has been collected several times in Costa Rica near the Panamanian border. It was collected in the Province of Chiriqui on Cerro Colorado, 50 km N of San Felix on the continental divide in cloud forest, alt. 1,200–1,500 m.

a. Leaf blades bullate ---------- 1. *L. bullata*
aa. Leaf blades not bullate.
  b. Leaves 8–15 cm long, 3.0–4.3 cm wide; lateral veins ca. 10 ---------- 2. *L. laurifolia*
  bb. Leaves (10–)20–45 cm long, more than 6 cm wide; lateral veins 10–12 ---------- 3. *L. macrocarpa*

1. **Ladenbergia bullata** (Wedd.) Standley, Trop. Woods 34: 41. 1933.

Cascarilla bullata Wedd., Ann. Sci. Nat. Bot. Sér. 3. 10: 11. 1848. TYPE: not seen.

Trees or shrubs to 5 m tall, the twigs pubescent or glabrescent, ultimately angular, the nodes well spaced below, somewhat crowded terminally. *Leaves* oblong rotund, 11.5–38.0 cm long, 8–26 cm wide, rounded or obtuse at the apex, not acuminate, basally rounded, obtuse or truncate, the costa plane or immersed above, prominent beneath, to 0.35 cm wide, the lateral veins 8–11, widely arcuate, strict, prominent beneath, the intervenal areas spreading reticulate, coriaceous, drying dark brown above, bullate, glabrescent to golden villosulose above, golden appressed pilose beneath; petioles 2.0–4.5 cm long, rigid, lignose, golden villosulose; stipules not seen. *Inflorescences* terminal, solitary, golden villosulose, cymose paniculate, to 14 cm long, to 10 cm wide, the peduncles 0.5–4.5 cm long, the lowermost branches opposite, 1–2 cm long, angular, usually with 2 pairs of opposite, strongly ascending, superior branches. *Flowers* sessile or subsessile; hypanthium subturbinate, ca. 1 cm long, densely golden villosulose, the calycine cup cupuliform, ca. 3 mm long, coriaceous, pubescent outside, glabrous within, the lobes 5, 1–2 mm long, oblong to rotund, obtuse or rounded, coriaceous, golden villosulose on margins and outside, glabrous within, drying much darker than the hypanthium; corolla white, the tube narrowly cylindrical, 3.5–5.0 cm long, 0.35–0.50 cm wide, densely villosulose outside, the hairs occasionally tufted, glabrous but rugulose within, coriaceous, the lobes narrowly oblong, 2.0–2.5 cm long, crassate, carnose and rugulose within; stamens 5, the anthers with tips

barely exserted from tube, narrowly oblong, ca. 7 mm long, the filaments ca. 2.5 mm long, glabrous, somewhat geniculate at point of attachment, attached ca. 1 cm below the mouth; style ca. 25 mm long, plano compressed, villose, the stigmatic lobes 2, ca. 1.8 mm long. *Fruits* with pedicels to 1.5 cm long, narrowly oblong, to 9 cm long, the valves at dehiscence to 2 cm wide, obtuse or rounded at the apex, cuneate at the base, smooth, rugulose, glabrescent at maturity, with a few slender longitudinal prominulous lines outside, the calycine cup persistent in unopened fruit, finally deciduous in open fruit.

PANAMÁ: 8 mi S of Goofy Lake toward Cerro Jefe, *Dwyer 7080* (MO). Cerro Campana, *Gentry 1840* (MO). Cerro Jefe, *Gentry et al. 3407* (MO); *Gentry & Dwyer 5542* (MO). Cerro Azul, just E of Goofy Lake, *Gentry & Mori 13403* (MO). El Llano-Cartí Road, *Liesner 1260* (MO); *Mori et al. 4681* (MO).

2. **Ladenbergia laurifolia** Dwyer,[67] spec. nov. TYPE: Panamá, *Croat 25586* (MO).

Trees to 5 m tall, the twigs terete, the bark grey when dry, lenticellate, the nodes well spaced, the scars of the pedicels oblong rotund, ca. 4 mm in diam. *Leaves* narrowly oblong or narrowly obovate oblong, 8–15 cm long, 3.0–4.3 cm wide, deltoid toward the apex, acuminate, the acumen triangular, to 0.6 cm long, obtuse, widely cuneate or obtuse at base, the costa prominulous above, subprominent beneath, dark red, the lateral veins ca. 10, subplane on both sides, arcuate, the submarginal vein undulate and inconspicuous, the margin lightly revolute; petioles lignose, rigid, glabrous, to 2 cm long; stipules deciduous. *Inflorescences* terminal, to 11 cm long, golden puberulent, dark red when dry, the peduncle to 0.2 cm wide, the branches 3, terminating a small branch, the lateral branches shorter and with 3 secondary branches at the apex, the cymes few flowered, the middle branch similar to the lateral branches but with the cymes spreading and often on branches to 1.5 cm long; bracts oblong ovate, to 2 mm long, puberulent, the bracteoles deciduous, to 1 mm long. *Flowers* sessile; hypanthium turbinate, ca. 4 mm long, densely sericeous, the calycine cup somewhat swollen, ca. 0.5 mm long, the lobes 5, widely triangular or ovate, 0.3–1.2 mm long, obtuse, carnose, glabrescent outside except at the base and the margins, red when dry, minutely punctate; corolla white, the tube narrowly hypocrateriform, to 1 cm long, to 0.5 cm wide, densely sericeous outside, stiffly carnose, the lobes 5, oblong, to 1.2 cm long, to 0.3 mm wide, glabrous within; stamens 5, the anthers linear oblong, ca. 5 mm long, ca. 0.6 mm wide, obtuse, the filaments ca. 1 mm long, attached near the middle of the tube; ovarian disc cushion like, ca. 0.4 mm long, the style slender, ca. 1.5 cm long, the stigmas 2, linear oblong, ca. 2.2 mm long, puberulent(?), the ovules membranous, winged, plano compressed, oblong, ca. 0.3 mm long. *Fruits* not seen.

Ladenbergia laurifolia is known only from Panama. The general aspect of the

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[67] *Ladenbergia laurifolia* Dwyer, spec. nov. *Arbores* ad 5 m altae. *Folia* angusto-oblonga vel angusto-obovato-oblonga, 8–15 cm longa, 3.0–4.3 cm lata, versus apicem deltoidea venis lateralibus ca. 10; petiolis ad 2 cm longis. *Inflorescentiae* terminales, ad 11 cm longae, aureo-puberulae, cymis paucifloris; bracteis oblongo-ovatis, ad 2 mm longis. *Flores* sessiles; cupula calycis ca. 0.5 mm longa, lobis 5, 0.3–1.2 mm longis; corolla alba tubo ad 1 cm longo, lobis 5, ad 1.2 cm longis; antheris ca. 5 mm longis, subsessilibus. *Fructus* non visi.

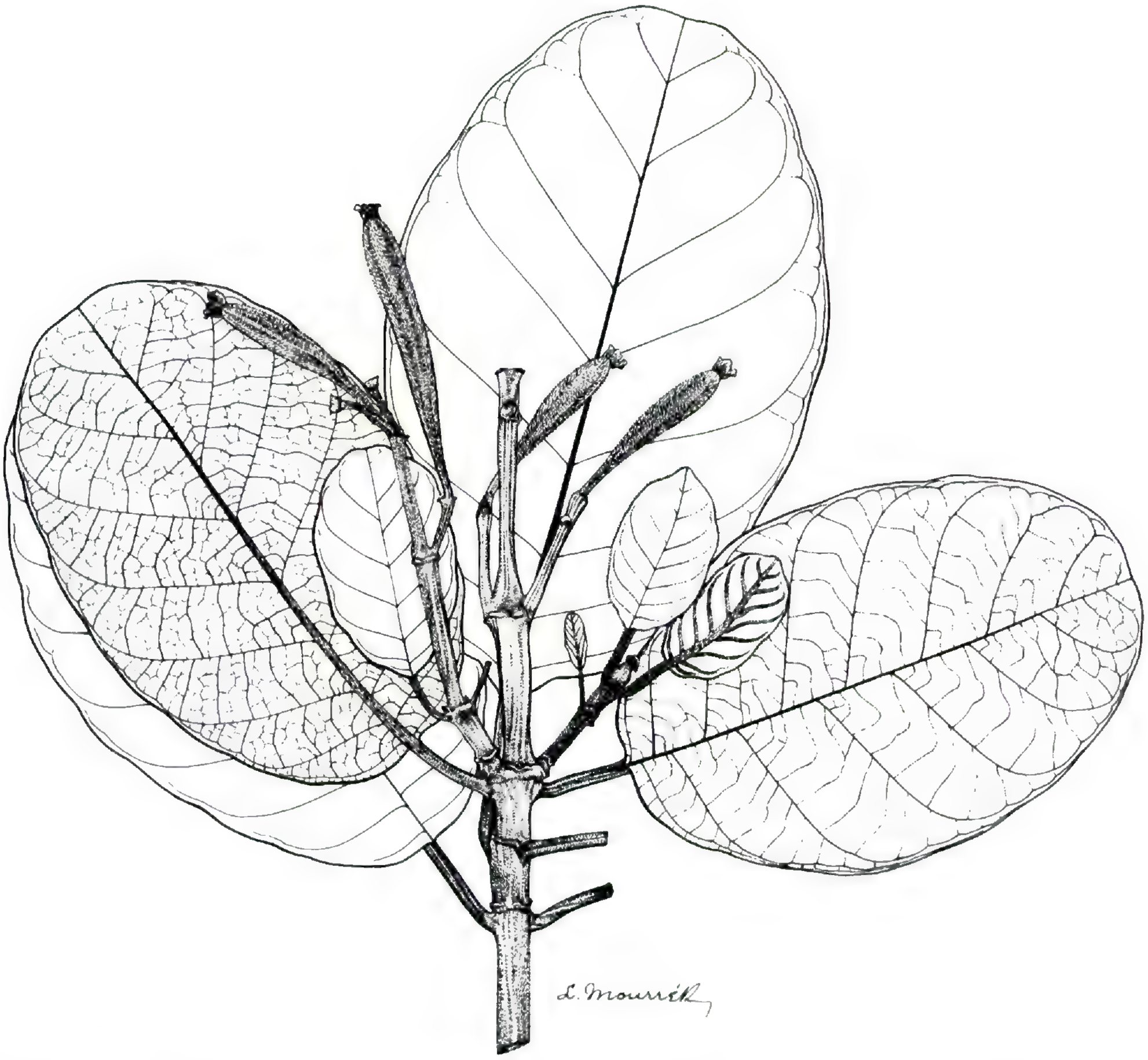

FIGURE 56. *Ladenbergia macrocarpa* (Vahl) Klotzch. Habit (×3/10). [After *Mori & Kallunki 5501*.]

leaf resembles that of a Lauraceae, the color suggesting the dried blades of a Myristicaceae. *L. laurifolia* has the smallest leaves among the Central American species of the genus. The flowers are markedly small.

VERAGUAS: Beyond Río Tres Brazos, 9 km from Santa Fé, *Croat 25586* (MO).

3. **Ladenbergia macrocarpa** (Vahl) Klotzch in Hayne, Arzn. Gew. 14: 15. 1846.—FIG. 56.

Cinchona macrocarpa Vahl, Skiv. Naturh. Selsk. 1: 120. 1790. TYPE: not seen.
Cascarilla macrocarpa (Vahl) Wedd. Ann. Sci. Nat. Bot. Sér. 3. 10: 13. 1848.

Trees to 40 ft tall, the trunks often buttressed, the branches smooth, glabrous, usually angular. *Leaves* oblong or obovate oblong, 10–45 (or more) cm long, 6–24 cm wide, obtuse at the apex, acuminate, the acumen short or evanescent, the costa plane or prominulous, to 0.5 cm wide, expanded toward the petiole, prominent beneath, the lateral veins 10–12, prominent beneath, coriaceous, glabrous to densely golden pubescent above, glabrous to densely golden villosulose or

appressed pilose beneath, often the axils barbate, shiny, dark brown when dry; petioles to 4.5 cm long; stipules crowded toward the apex of the twigs, persistent or deciduous, oblong rotund, 1.5–3.5 cm long, to 2.5 cm wide, rounded at the apex, coriaceous, glabrescent, venose, shiny. *Inflorescences* terminal, solitary, minutely pubescent or glabrescent, to 20 cm long, to 22 cm wide, presumably epedunculate, the several branches sharply ascending and terminating the twiglets, 4–9 cm long, angular. *Flowers* scarcely pedicellate; hypanthium narrowly turbinate, to 0.8 cm long, tapering gradually into the pedicel, drying blackish, smooth, glabrous or puberulent, the calycine cup bowl shaped, to 0.7 cm long, the teeth triangular to rotund, 1.5–2.8 mm long, often obtuse; corolla with the tube narrowly cylindrical, 3.5–5.0 cm long, apically 3–4 mm wide, the lobes narrowly oblong, ca. 3.5 cm long, ca. 0.35 cm wide, densely golden pubescent; anthers 5, subsessile, ca. 6 mm long, ca. 1 mm wide, attached near the mouth. *Fruits* scarcely pedicellate, narrowly oblong, often slightly falcate, 7.0–13.5 cm long, 0.8–1.2(–1.8) cm wide, obtuse at the apex, attenuate toward the base, lignose, glabrescent to densely golden pilose, drying black brown or golden tan, delicately longitudinally striate ribbed, the persistent calycine cup 6–8 mm long, the calycine lobes ca. 1 mm long, the valves at dehiscence to 1.8 cm wide; seeds narrowly oblong or subfusiform, 1.0–2.5 cm long, the body 1–5 mm long, the wings often split or erosulose at the distal pole, acute at the proximal pole.

A collection of this species, *Mutis 6219* (F), from Colombia has a manuscript name *L. colombiana* which has not been validly published.

Ladenbergia macrocarpa is known from Panama, Colombia, and south to Boliva. "Fruta Mono," "Michurajo."

DARIÉN: Cloud Forest on Cerro Pirre, 3700 ft, *Duke 6571* (MO). W slope of Cerro Pirre, *Duke 6590* (MO). Caná-Cuasí Trail between Cerro Campamento and La Escalera, E of Tres Bocas, *Kirkbride & Duke 1313* (MO). N slope of Cerro Pirre, lower montane rain forest, 700–950 m, *Mori & Kallunki 5501* (MO).

52. LIMNOSIPANEA

Limnosipanea Hook. f. in Hook., Icon. Pl. Ser. 3. 1(11): 38, *pl. 1050*. 1868. TYPE: Brazil, *Limnosipanea spruceana* Hook. f.

Sipania Seemann, Bot. Voy. Herald 136. 1853. TYPE: *S. palustris* Seem., not *Sipanea* Aubl. 1775, (Rubiaceae).

Herbs, slender, erect, branching above, the branches dichotomous. *Leaves* 3 to numerous at a node, verticillate, the uppermost occasionally opposite; stipules obsolete, often reduced to a subulate projection. *Inflorescences* cymose with flowers solitary or in few-flowered terminal clusters in the angles or along the length of usually dichotomous branches. *Flowers* with the calycine lobes somewhat foliaceous, persistent; corolla variously colored, hypocrateriform, the tube narrow, glabrous within, the mouth glabrous or variously pubescent, the lobes 5, oblong, contorted; stamens 5, inserted at the mouth, the anthers oblong, dorsifixed, the filaments slender; ovary 2-celled, the ovules numerous, disposed on a median septum. *Capsule* ovoid, scarious, loculicidally dehiscent, the seeds numerous.

Limnosipanea is a genus of about 7 species, one of which is in Panama, the others in tropical South America.

Literature:

Standley, P. C. 1928. Flora of Panama Canal Zone, Contr. U.S. Natl. Herb. 27: 355.
Steyermark, J. 1974. *Limnosipanea* Hook. f. Flora de Venezuela 9(1): 384.
Wernham, H. F. 1917. The Genus *Sipanea*. J. Bot. 50: 171–175.

1. **Limnosipanea palustris** (Seem.) Hook. f. in Hook., Icon. 1050 (*p. 38*). 1868.

Sipania palustris Seem., Bot. Voy. Herald 136. 1853. TYPE: Panamá, *Seemann 347* (BM, excl. specimen *Microlicia*, Melastomalaceae, not seen; MO, photo of holotype).

Perennial? *herbs*, the stem slender, erect, branching only in the upper ⅓, pubescent, the nodes well spaced. *Leaves* ternate, the uppermost opposite, sessile, erect, except the basal leaves often deflexed, oblong, ca. 8 mm long, ca. 2 mm wide; stipules not seen. *Flowers* small, solitary or in few-flowered cymules, terminating a pair of dichotomously disposed, angular, ascending branches, presumably a solitary flower in the angle of the dichotomy.

Limnosipanea palustris is known only from the Seemann collection (Panama) and another from Colombia (Goudot?), neither seen by the author except for a photograph of the first. As the species is known to me only by a photograph, floral details have been omitted in the diagnosis.

The type collection (*Seemann 347*, BM) has two different elements, one a Melastomataceae which superficially looks like *Limnosipanea palustris* but is probably a species of *Microlicia*. The specimen, on close examination, seems to have been first mounted on a separate piece of paper, this then pasted to the overall sheet containing the type material of *Limnosipanea palustris*.

Standley (1928) said about *Limnosipanea palustris*: "The only North American species, *L. palustris* (Seem.) Hook. f. was collected once in a swamp near Panama City, but has not been found again. It is a perennial herb with hirsute stems, ternate, sessile ovate-lanceolate leaves, and terminal cymes of small pink flowers." He may have drawn freely on Seemann's original description of *Sipania palustris*: "caule hirsuto basi repente, foliis ternis sessilibus ovato-lanceolatis acutis glabris, floribus in dichotomia solitariis sessilibus, laciniis calycinis lineari-lanceolates acutis bi-aristatis, corolla glabra vel intus subpuberula, capsula subrotunda, setoso-pilosa. In swamps, near Panama, growing together with *Noterophila inundata* Mart." (Melastomataceae). *Noterophila* has been reduced to synonymy under *Microlicia*.

On the other hand Standley may have seen the type sheet under discussion in the British Museum. In his diagnosis (repeated in North American Flora) he described the leaves as "ovate-lanceolate" when in actuality they are oblong. The leaves of *Microlicia* are strikingly ovate-lanceolate, as is easily seen on the photograph of the sheet under discussion.

Thus, it is possible that both Seemann and Standley used the *Microlicia* for parts of their diagnosis of *Limnosipanea palustris*, and they may have failed to

FIGURE 57. *Lindenia rivalis* Benth. Habit (×4/5). [After *Stern et al. 7.*]

note that the sheet has been annotated with the name *Noterophila* (Melastomataceae). The enlargement on the photograph taken by Nowicke (MO) is of the Melastomataceae rather than the Rubiaceae element.

53. LINDENIA

Lindenia Benth., Pl. Hartw. 84, 351. 1841. TYPE: *L. rivalis* Benth.

Siphonia Benth., Pl. Hartw. 84. 1841, not Schreber, 1791, nomen nudum.

Shrubs, glabrous or pubescent, the branchlets terete. *Leaves* short petiolate; stipules connate, short. *Inflorescences* terminal, cymose, the flowers few; bracts subulate. *Flowers* pedicellate, large, showy; hypanthium turbinate, 5-ribbed, the calyx with 5 elongate lobes, equal or unequal, persistent in fruit; corolla salverform, elongate, the lobes 5, oblong, contorted in bud; stamens 5, inserted at the top of the corolla tube, the anthers sessile, linear, exserted; style slender, the stigmatic lobes 2, pilose, erect. *Fruits* clavate or pyriform, 2-celled, septicidally bivalvate, the valves splitting apically, often elastically coiled; seeds numerous, angulate.

Lindenia is a genus of 2 species, one in the Old World and one in the New World.

Literature:

Darwin, S. P. 1976. The genus *Lindenia* (Rubiaceae). J. Arnold Arb. 57: 426–449.

1. **Lindenia rivalis** Benth., Pl. Hartw. 84. 1841. TYPE: México, *Hartweg 581* (K, not seen; photo, MO).—FIG. 57.

L. acutiflora Hook., Icon. Pl. 475. 1842. TYPE: México, *Linden 358* (not seen).

Subshrubs to 1.5 m tall, branching freely above, the leaves terminally aggregated, the branchlets stout, terete, smooth, drying black, often with an ericoid appearance, glabrous or minutely puberulent. *Leaves* salicoid or narrow elliptic, occasionally subfalcate, 4–12 cm long, 0.8–2.5 cm wide, acute at the apex and the base, occasionally vaguely acuminate, the costa subplane to prominulous above, prominulous beneath and rubescent, the lateral veins 7–8, strongly arcuate, reaching the margin or anastomosing to form a submarginal undulate vein, smaller intermediate veins soon evanescent, papyraceous to thinly coriaceous, glabrous above, glabrous or puberulent beneath especially on the costa and the veins, the margin often revolute; petioles absent or 0.2–1 cm long, the lamina slightly decurrent, dilated proximally. *Flowers* solitary, terminal, large, showy; hypanthium oblong, ca. 1 cm long, puberulent, the calycine cup scarcely measurable, the calycine lobes subulate, subequal, ca. 20 mm long, thinly carnose, puberulent with several rows of minute rubescent glands located basally within; corolla white, the tube slender, to 20 cm long, ca. 0.35 cm wide in middle, scarcely expanded at the apex and the base, pubescent outside, glabrous within, the lobes 5, elliptic oblong or rhombic oblong, 1.5–2.5 cm long, to 1.2 cm wide, subacute or obtuse at apex; stamens 5, the anthers linear ovate to oblong, ca. 1 cm long,

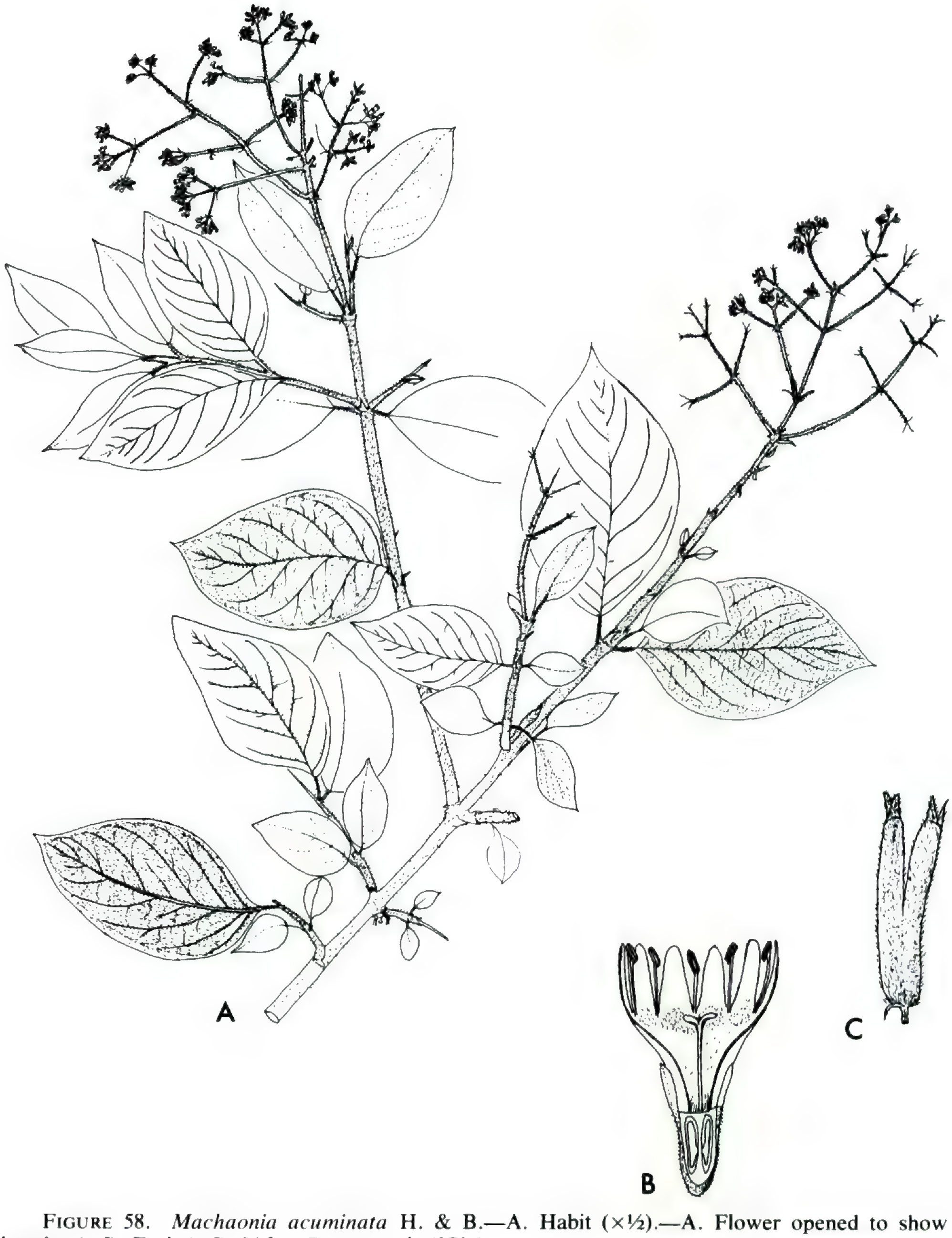

FIGURE 58. *Machaonia acuminata* H. & B.—A. Habit (×½).—A. Flower opened to show interior (×5). Fruit (×5). [After *Tyson et al. 4273.*]

glabrescent with a few short hairs, the filaments attached near the mouth, the style slender, about as long as the tube, villose below middle, the stigmatic area ca. 1 cm long, barely exserted, divided above middle into 2 lobes, these oblong, ca. 0.2 cm wide, obtuse. *Fruits* capsular, pyriform, to 4 cm long (including persistent calycine teeth), minutely pubescent, lignose, costate, drying dark, at first rupturing terminally at the ovarian disc position.

Lindenia rivalis is common throughout Central America and Mexico; it has been erroneously reported from the island of Tobago. The only other species in the genus, *L. vitiensis* Seem. occurs in Fiji and New Caledonia. "Guabita de Quebrada."

CANAL ZONE: Road K-6 E of Arraijan, *Croat 15036* (MO). K-9 Road, *Dwyer 3008* (MO). Pipeline Road, 16.6 km from beginning of road, *Mori & Kallunki 2043* (MO). Río Cocolí, Road K-9, *Stern et al. 7* (MO). DARIÉN: Río Mortí Drill Site 7, ca. 250 m, *Duke 14208* (MO). HERRERA: Las Minas, Río Las Trancas, *Stern et al. 1788* (MO). PANAMÁ: Río La Maestra, *Allen 24* (MO). Río Maje above first waterfall on steep wooded slopes, *Croat 34411* (MO). Río Maje 4–5 mi above waterfall near new Bayano Lake, 100 m, *Croat 34710* (MO). Panamerican Highway, near Jenené, Río Cañita, *Duke 3842* (MO). Río Bayano, crossing Panamerican Highway, *Duke 3984* (MO). Río Pasiga, to above waterfall on 2nd main fork, *Gentry 2298* (MO).

54. MACHAONIA

Machaonia H. & B., Pl. Aeq. 1: 101. 1806. TYPE: *M. acuminata* H. & B.

Shrubs or trees, often armed. *Inflorescences* terminal, cymose paniculate, the flowers bracteate. *Flowers* with the calyx obovoid or turbinate, the calycine cup cupuliform, 4–5-lobed; corolla with the tube funnelform, hairy within, the lobes 4–5; anthers dorsifixed, included or exserted, the filaments short or long; ovarian disc fleshy, the style slender, the stigmas 2, the ovary usually 2-celled, the ovules solitary, pendulous. *Fruits* of 2 trigonous, indehiscent 1-seeded cocci separating from below upwards from the persistent axis; seeds elongated, cylindrical, the testa thin.

Machaonia is found in Mexico, Central America, tropical South America, and the West Indies. It is a genus of about 30 species.

Literature:

Standley, P. 1934. 71. *Machaonia* H. & B. *in* North Am. Flora 32(3): 215–222.

a. Leaves with 8–10 lateral veins; buds with the corolla 1.0–1.5 mm wide at the apex; anthers 0.3–0.5(–0.6) mm long ..... 1. *M. acuminata*
aa. Leaves with 6–7 lateral veins; buds with the corolla ca. 2.5 mm wide at the apex; anthers ca. 0.6 mm long ..... 2. *M. martinicensis*

1. **Machaonia acuminata** H. & B., Pl. Aeq. 1: 101. 1806. TYPE: Ecuador, *Humboldt & Bonpland*, not seen.—FIG. 58.

M. tysonii Dwyer, Ann. Missouri Bot. Gard., 53: 106. 1966. TYPE: Panama, *Dwyer 5061* (MO, holotype).

Shrubs or small trees, occasionally armed with spines at nodes, to 1.2 cm long, lignose, occasionally with very small spinules, the branchlets terete, smooth, occasionally lenticellate, glabrous or puberulent, the nodes well spaced, frequently distichous. *Leaves* oblong, ovate oblong, ovate rotund, 4.5–10.0 cm long, 1.5–6.0 cm wide, deltoid to obtuse at the apex, often falcate cuspidate, the cusp usually short, the base acute, obtuse or rounded, occasionally slightly inequilateral, the costa immersed or prominulous above, prominent beneath, the lateral veins 8–10, arcuate, immersed or prominulous above, prominulous beneath, chartaceous, often stiff, usually concolorous, glabrate to villosulose above

and beneath, the intervenal areas reticulate, the veinlets immersed beneath; petioles 0.5–2.0 cm long, slender, to 0.1 cm wide, puberulent, the hairs often dense only on the adaxial side; stipules free, small, compressed rotund, ovate oblong or triangular, 2.0–3.5 mm long, acute or constricted terminally into a subulate extension about as long as the body, pubescent. *Inflorescences* terminal, exceeding the uppermost leaves, thrysoid paniculate, 4–15 cm long, 3–9(–15) cm wide, the peduncles 2–4 cm long, to 0.2 cm wide, pubescent, the lowermost 2–4 pairs of branches usually opposite, usually strict and divergent, to 7 cm long, usually with 1 or 2 pairs of opposite secondary branches or with branches ternately disposed, the cymules terminal, densely flowered. *Flower* buds apically 1.0–1.5 mm wide, white, 4.2–5.0 mm long, the hypanthium turbinate or oblong, to 2 mm long, carnose, densely villosulose, the calycine cup scarcely measurable, glabrous and eglandular within, the lobes 5–6, erect, unequal, oblong, 0.6–1.0 mm long, villosulose outside and marginally; corolla tube compressed cylindrical, to 1.5 mm long, sparsely puberulent or occasionally glabrous outside, densely white villose within; stamens 5, the anthers oblong or subrotund, 0.3–0.6 mm long, dorsifixed, the filaments about as long as the anthers, attached near the apex of the tube; stigmas 2, erect, linear, 0.3–0.6 mm long, the style 1.0–3.5 mm long. *Fruits* turbinate, to 7 mm long, puberulent.

This species extends from Mexico southward to Brazil.

CANAL ZONE: Farfan Beach, *Dwyer & Hayden 7533* (GH, K, MO, UC, US); *Dwyer & Lallathin 8788* (MO). Coco Solo, *Gentry 6055* (MO). COCLÉ: Río Hato Airstrip, *Blum & Dwyer 2468* (MO). Ca. 14 mi W of Río Hato, *D'Arcy & D'Arcy 6277* (MO). Río Hato Airstrip, *Dwyer 5061* (MO). La Pintada, *Escobar 11* (MO). Aguadulce, *Stimson 5301* (MO); *Woodson et al. 1205* (MO). COLÓN: Miguel de la Borda, *Croat 9843* (MO). 2 m S of Portobelo, *Croat 11413* (MO). DARIÉN: Puerto St. Dorothea, *Dwyer 2293* (MO). HERRERA: Chitre, *Allen 1100* (MO). Ocú, *Ebinger 1081* (MO); *Lao 146* (MO). PANAMÁ: Bejuco, *Woodson et al. 1680* (MO). SAN BLAS: Mulatuppu (Río Ibedî), *Duke 8468* (MO). Ailigandí, *Dwyer 6808* (MO). VERAGUAS: Santiago, *Croat 10733* (MO); *Dwyer 1270* (MO), *7429* (COL, MO, UC), *7553* (MO, UC). San Francisco, Río Los Chorros, *Dwyer 1354 A* (MO). Santiago, *Stern et al. 993* (MO). Soná, *Tyson et al. 4265* (MO). 5 mi E of Santiago, *Tyson et al. 4273* (MO).

2. **Machaonia martinicensis** (DC.) Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 193. 1940.

Tertrea martinicensis DC., Prodr. 4. 481. 1830. TYPE: not seen.
Schiedia martinicensis (DC.) A. Rich., Mém. Soc. Hist. Nat. Paris 5: 187. 1834.
Machaonia rotundata Griseb., Fl. Brit. W. I. 348. 1861. TYPE: Jamaica, not seen.
M. rotundata var. *dodgei* Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 1326. 1938. TYPE: Costa Rica, *Dodge 7752* (F, holotype).

Shrubs, *vines*, or *trees*, to 10 m tall, the branchlets occasionally armed at the nodes with spines to 1.3 cm long, lignose, the twiglets terete, smooth, glabrate, the nodes 2–5 cm apart. *Leaves* opposite or rarely alternate, widely oblong, occasionally elliptic, 4–11 cm long, 1.8–4.5 cm wide, acute or rounded at the apex, usually contracted into a short acumen 0.3–1.0 cm long, basally widely cuneate to subobtuse, the costa slender, plane or prominulous above, prominulous to prominent beneath, the lateral veins 6–7, arcuate, the intervenal areas minutely mosaiclike, chartaceous, usually concolorous, glabrous above and beneath except often minutely barbate in the axils; petioles to 1.2 cm long, 0.5–1.2 mm wide, glabrous or puberulent on the adaxial side; stipules minute, 2.5–3.0

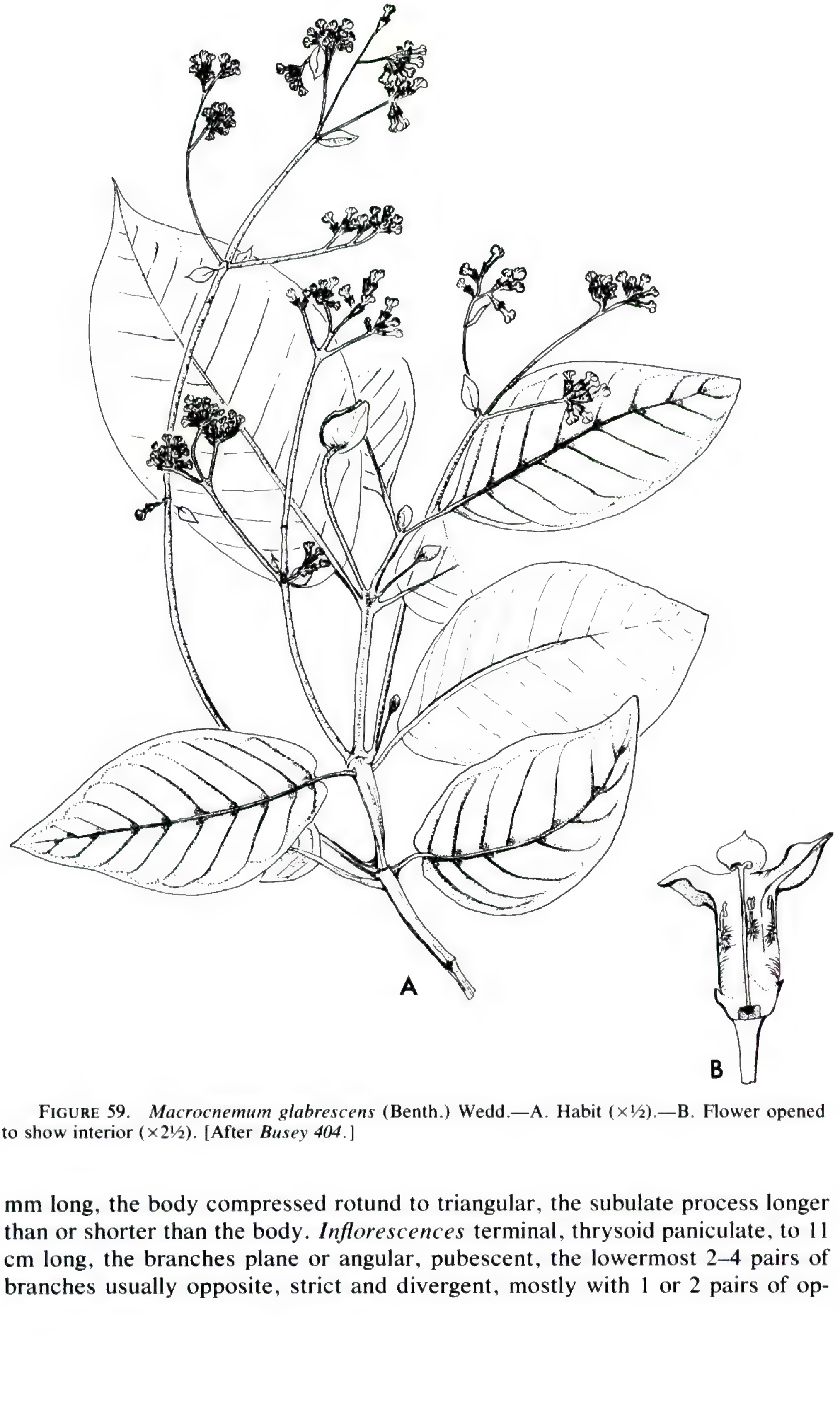

FIGURE 59. *Macrocnemum glabrescens* (Benth.) Wedd.—A. Habit (×½).—B. Flower opened to show interior (×2½). [After *Busey 404*.]

mm long, the body compressed rotund to triangular, the subulate process longer than or shorter than the body. *Inflorescences* terminal, thrysoid paniculate, to 11 cm long, the branches plane or angular, pubescent, the lowermost 2–4 pairs of branches usually opposite, strict and divergent, mostly with 1 or 2 pairs of op-

posite secondary branches; bracts usually linear, 5 mm long, sometimes larger and leaflike, the cymules terminal, densely flowered. *Flowers* 5.5–6.5 mm long, the buds usually 2.5 mm wide at the apex; hypanthium turbinate, the hypanthium and calyx ca. 2.5 mm long, glabrate, the hairs small and somewhat webby or larger and subulate, to 0.2 mm long, white, drying red, the calycine lobes 5, erect, unequal, to 1.2 mm long, obtuse, villosulose and often sparsely pubescent on the margins; corolla white or pale green, the tube turgid, compressed cylindrical, to 2.5 mm long, sparsely villose outside, densely villose at the mouth within; stamens 5, the anthers oblong, ca. 0.6 mm long, the stigmas 2, linear, to 1.2 mm long, the style ca. 3.5 mm long, frequently exserted. *Fruits* turbinate, to 6 mm long, glabrate.

Machaonia martinicensis is found in Jamaica, Panama, Costa Rica, and Colombia. *Duke 9719* notes that "the flowers are very attractive to ants and bees."

BOCAS DEL TORO: Macaw Hills, *Wedel 548* (MO). Nances Cay Island, *Wedel 585, 2862* (both MO). Water Valley, *Wedel 834, 1751, 1788* (all MO). Fish Creek Hills, *Wedel 2446* (MO). PANAMÁ: Coco Solo Weather Station, *Duke 4287* (MO). COLOMBIA: ANTIOQUIA: Punta Las Barcas Turbo, sea level, *Duke 9718* (MO).

55. MACROCNEMUM

Macrocnemum P. Br., Hist. Jam. 165. 1756. TYPE: *M. jamaicense* L.

Trees or shrubs, the branchlets terete. *Leaves* opposite, petiolate; stipules oblong or obovate. *Inflorescences* terminal or axillary, paniculate. *Flowers* with the calycine cup cup-shaped, the teeth 5, persistent; corolla funnelform or salverform, the lobes 5, in bud drawn in so as to give a maltese cross pattern in top view, spreading at anthesis, wider than long, pubescent within, valvate or reduplicate; anthers oblong, included, the filaments partly villose; ovary 2-celled, the ovules numerous. *Fruits* capsular, bisulcate, dehiscing loculicidally into 2 valves; seeds winged.

Macrocnemum ranges from Central America to Colombia, and it also occurs in the West Indies. It is a genus of about 20 species, easily recognized by the configuration of the corolla lobes in the bud stage.

a. Corolla tube glabrous outside; anthers ca. 1 mm long ..... 1. *M. glabrescens*
aa. Corolla tube golden puberulent outside; anthers ca. 0.7 mm long ..... 2. *M. pastoense*

1. **Macrocnemum glabrescens** (Benth.) Wedd., Ann. Sci. Nat. (Paris) 4. 1: 76. 1854.—FIG. 59.

Lasionema glabrescens Benth., Bot. Voy. Sulphur 105. 1844. TYPE: not indicated.

Trees to 8 m tall, the branchlets terete, ultimately angular, glabrous, the nodes usually well spaced. *Leaves* obovate oblong, spathulate, oblong, often vaguely falcate, widely deltoid to obtuse at the apex, acuminate or cuspidate at the apex, the cusps to 1 cm long, basally obtuse, acute or rounded, often inequilateral, the costa plane or immersed above, prominulous beneath, the lateral veins 7–9, arcuate, chartaceous to papyraceous, usually discolorous, glabrescent above and beneath, occasionally glabrous, often barbate on the costa and the veins beneath;

petioles 0.5–1.5 cm long, usually stiff; stipules deciduous, foliaceous, oblong or ovate oblong, 1.0–1.5 cm long, obtuse. *Inflorescences* terminal or axillary, thrysoid paniculate, to 30 cm long, either sessile and with usually 3 branches arising from the stem tip, or pedunculate and the peduncles to 11 cm long, glabrescent, the branches few, well spaced, usually opposite or ternately disposed, the lowermost to 14 cm long, arcuate or strict, the cymules terminal, few flowered, spreading; bracteoles subulate, divergent. *Flowers* sessile or subsessile, darkening at maturity, the buds clavate capitate; hypanthium oblong, ca. 3.2 mm long, ca. 2.2 mm wide, villosulose, the calycine tube somewhat inflated, 0.5 mm long, petaloid, glabrous inside and out, venose, the calycine teeth 5, triangular, to 1 mm long, minutely puberulent on the margin; corolla pink, the tube cylindrical, 5 mm long or longer, ca. 2 mm wide, stiffly petaloid, glabrous outside and in except usually villose at filament attachment point, the lobes 5, oblong rotund, to 6.5 mm long, glabrous, venose; stamens 5, the anthers oblong rotund, ca. 1 mm long, dorsifixed with a glandular patch at point of filament attachment, the filaments unequal, slender, subulate, 2.5–4.0 mm long, densely villose below the middle, attached at about middle of the tube and continuing downwards in riblike fashion; stigmas 2, oblong, ca. 0.5 mm long, convex in cross section, the style thickly subulate, 6–8 mm long, ca. 0.25 mm wide in middle. *Fruits* elliptic or fusiform, to 2.5 cm long, to 0.35 cm wide before opening, on opening the valves united at the apex and the base, the interior of valves smooth, yellow, the outside delicately ribbed, pubescent, glabrous, capped by a saucerlike calycine cup and ovarian disc, both to 1 mm long; seeds membranaceous, fusiform, to 3 mm long, often falcate, alate, the surface with crowded irregular lines.

Macrocnemum glabrescens is known from Costa Rica, Panama, and Colombia. *Duke* (*8041*) indicates the fruits are eaten by loro. *Busey and Mahler* (*351*) note that the tree was covered with ants. "Palo cuadrado"; "Palo blanco"; "Madrono"; "Guanabana Torete"; "Cedro Macho"; "Cedro Chumaquino." In the type photo collection at the Missouri Botanical Garden there is a collection of Wagner from Panama deposited in the Herbarium Regium Monacense (Vienna). It is definitely *M. glabrescens*, but it is not the type.

BOCAS DEL TORO: Daytonia Farm, *Cooper 448* (MO). Between Buena Vista and Cerro Pilón, *Kirkbride & Duke 680* (MO). CANAL ZONE: Chiva-Chiva Trail, *Allen 2467* (F). Río Puente, between tunnel and natural bridge, *Dodge & Allen 17317* (MO). Chiva-Chiva Trail, *Fosberg 27392* (F). Summit, *Harvey 5227* (MO). Mindi Hills, *Johnston 1734* (MO). Near Gamboa, Río Mandinga, *Kennedy et al. 2382* (MO). Without other locality, *Lindsay 455* (MO). Gorgona, *Maxon 4741* (F, MO). Río Masambi Grande, 2 km N of Summit Garden, 80–100 m, *Nee 9417* (MO). 1 mi N of Summit, *Tyson et al. 2756* (MO). BARRO COLORADO ISLAND: *Aviles 50* (MO), *273* (F); *Bailey & Bailey 233* (F, MO), *234* (F), *244* (MO); *Bangham 172, 372* (both MO); *Brown 26, 76, 142, 193* (all F); *Chapman s.n.* (F); *Croat 4578, 4806, 4944, 4955, 5806, 5933, 7190, 7848, 8699, 11256A, 13169* (all MO); *D'Arcy 3929* (MO); *Dwyer et al. 8459* (MO); *Ebinger 293* (MO); *Foster 694, 698* (both F); *Frost 26, 135* (both F); *Shattuck 423, 659* (both F, MO), *811* (MO); *Wetmore & Abbe 218* (F); *Wilson 1* (F); *Woodworth & Vestal 333* (F, MO). CHIRIQUÍ: Corotú, 6 km SW of airport, Puerto Armuelles, *Busey 404* (MO). 9 km S × SW of Puerto Armuelles, *Busey 728* (MO). 12 mi W of Puerto Armuelles, *Croat 22155* (MO). 2 mi SW of Puerto Armuelles, *Croat 22454* (MO). COCLÉ: El Valle, *Allen 114* (F, MO), *2910, 4223* (both MO); *Hunter & Allen 302* (MO). COLÓN: Gatuncillo, *Correa et al. 734* (MO). DARIÉN: Río Pirre, *Bristan 56* (MO). Río Aruza, *Bristan 1346* (MO). Pidiaque, *Duke 8041, 8042* (both MO). Río Pirre, *Duke 8249* (MO). Río Sabana, ca. 4 m above Santa Fé, *Duke 10203* (MO). Between upper Río Membrillo and Camp M on construction road to San Blas, *Duke 10873* (MO). Manené near Cuasí, *Kirkbride & Bristan 1482* (MO). La Palma, *Pittier 6961* (F). PANAMÁ: Upper Río Pequeni between Salamanca Hydrographic Station and Río Boqueron, *Allen 17276* (MO). Las Cumbres, *Duke 11825* (MO). Isla

Pedro Gonzales, *Dwyer 1716* (MO). NW slope of Red Hill, San José Island, *Johnston 1309, 1366* (both MO). Alhajuela, *Pittier 2397* (F). VERAGUAS: Santa Fé, *Allen 4378* (MO). Santiago, *Dwyer 1351* (MO). Isla de Coiba, *Dwyer 2374* (MO).

2. **Macrocnemum pastoense** Karst., Linn. 30: 150. 1859. TYPE: Colombia, *Karst.*, not seen.

Trees to 8 m tall or shrubs, the branchlets terete, ultimately angular, smooth, minutely puberulent. *Leaves* oblong, oblong rotund or obovate oblong, 6–17 cm long, 4–10 cm wide, widely deltoid to rounded at apex, acuminate, the acumen short, widely deltoid, to 0.5 cm long, ultimately obtuse or acute, the base rounded or obtuse, the blade occasionally contracted at proximal ⅓, the costa plane or prominulous above, prominent beneath, the intervenal areas spreading reticulate, papyraceous, tending to dry dark at least on the upper side, glabrous above, puberulent beneath, barbate in the axils; petioles to 3 cm long, stiff, puberulent; stipules persistent only below inflorescence, oblong, oblong rotund to ovate oblong, 3 cm long, obtuse or acute, rimose, puberulent. *Inflorescences* solitary, terminal, occasionally terminal and axillary, cymose paniculate, to 22 cm long, to 10 cm wide, the peduncle to 12 cm long, terminated by a pair of reduced leaves, the lowermost branches opposite, to 7 cm long, divergent or arcuate ascending, the branches divided into 2 branchlets. *Flowers* sessile, the hypanthium densely golden puberulent, the calycine cup short, the 5 triangular teeth ca. 1 mm long, longer than the cup, golden puberulent; corolla purple or lilac, the tube narrow cylindrical 6–8 mm long, puberulent outside, glabrous within, thinly carnose, the lobes 5, in bud disposed as a hemispherical capitate mass to 0.3 cm long, 0.5 cm wide, when expanded the lobes hemispherical, wider than long, puberulent, the margin undulate; stamens 5, the anthers oblong, ca. 0.7 mm long, curved when mature, subversatile, the filaments slender, to 6 mm long, villose below the middle, attached below the middle of the tube; style slender, ca. 7 mm long, glabrous, the stigmas 2, when separated scarcely wider than the style, 0.3 mm long. *Fruits* not seen.

Macrocnemum pastoense is known only from Panama and Colombia.

DARIÉN: Piñas, *Duke 10610* (M0). Río Tuira, near mouth of Río Paya, *Gentry 4426* (MO). Yaviza along Río Chucunaque at El Punteadero, *Stern et al. 173* (MO). COLOMBIA: CHOCO: Río Mutata tributary Río El Valle, between base of Alto de Buey and mouth of river, 100–150 m, *Gentry & Fallen 17459* (MO).

56. MANETTIA

Manettia L., Mant. Pl. 553. 1771. Nomen conserv. TYPE: *M. reclinata* L.

Lygistum P. Br., Civ. Nat. Hist. Jam. 142. 1756. Nomen rejic. TYPE: *Petesia lygistum* L.
Nacibea Aubl. Hist. Pl. Guiane 1: 95. 1775. TYPE: no type indicated.
Conotrichia A. Rich., Mém. Soc. Hist. Nat. (Paris) 5: 277. 1829; Richard, Mem. Fam. Rub. 197. 1830. TYPE: *C. alba* (Aubl.) A. Rich.

Herbs or *vines*, sometimes woody. *Leaves* petiolate, the stipules small, persistent. *Inflorescences* axillary, cymose, occasionally terminal, the flowers occasionally solitary. *Flowers* variable in color, the calycine lobes usually 4, short or long, usually with teeth or small glands between the lobes; corolla tubular or

funnel shaped, 4-lobed; anthers exserted or included; ovary 2-celled, the ovules numerous. *Fruits* capsular, obovoid or turbinate, septicidally bivalvate, splitting from the apex; seeds compressed, winged.

Manettia occurs sporadically in Central America, abundantly in tropical South America, and the West Indies. It is a genus of about 130 species.

Literature:

Wernham, H. F. 1918. The genus *Manettia*. J. Bot. 57 (Suppl.): 1–44.

a. Herbs, upright or scarcely upright.
   b. Plants terrestrial; leaves sessile, the blades linear ovate or linear elliptic; flowers on pedicels to 6 mm long ..... 1. *M. bocataurensis*
   bb. Plants aquatic; leaves with petioles ca. 1 cm long, the blades ovate or rhombic ovate; flowers sessile ..... 3. *M. hydrophila*

aa. Vines.
   c. Calycine lobes (6–)8; flowers red or magenta rarely white ..... 4. *M. reclinata*
   cc. Calycine lobes 4; flowers white ..... 2. *M. flexilis*

1. **Manettia bocataurensis** Dwyer.[68] TYPE: Panama, *Croat & Porter 16334* (MO, holotype).

Herbs, the stems weak, scarcely erect, smooth, glabrous, the nodes well spaced. *Leaves* sessile, narrowly ovate or narrowly elliptic, 2.5–7.0 cm long, 0.3–1.0 cm wide, acute at the apex and at the base, the costa plane above, subplane beneath, the lateral veins ca. 5, strongly arcuate, the veins of the intervenal areas not visible, thin membranous, glabrous except the minutely pubescent, slightly revolute margins, concolorous, shiny, with minute white cystoliths beneath; stipules compressed hemispherical, 2.0–3.7 mm long, the awns 3, subulate, equal or unequal, to 2.5 mm long. *Flowers* solitary, axillary; pedicels slender, to 6 mm long, puberulent; hypanthium subrotund, 1.5 mm long, glabrescent, the calycine lobes subulate, to 1.8 mm long, puberulent; corolla white, the tube cylindrical, to 1.2 mm long, glabrous, the lobes short. *Fruits* rotund, ca. 3.5 mm in diam., black when dry, glabrate, the calyx persistent.

Manettia bocataurensis is known only from Panama. It is related to *M. stenophylla* Donnell Smith, from Costa Rica, the type of which is *Tonduz 12969* (F). The latter species has some of the flowers short-pedicellate, in cymes, and to 8 mm in length.

BOCAS DEL TORO: Railroad near station at Milla 10, *Croat & Porter 16334* (MO).

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[68] *Manettia bocataurensis* Dwyer, spec. nov. *Planta* vix erecta caulibus glabris. *Folia* sessilia lineari-ovata vel lineari-elliptica, 2.5–7.0 cm longa, 0.3–1.0 cm lata, venis lateralibus ca. 5 forte arcuatis, tenui-membranacea glabra praeter margines minuto-pubescentes; stipulis compresso-hemisphaericis, 2.0–3.7 mm longis, setis 3, ad 2.5 mm longis. *Flores* in axillis solitariae pedicellis gracilibus, ad 6 mm longis; hypanthio subrotundo, ca. 1.5 mm longo, lobis calycis subulatis, ad 1.8 mm longis; corolla alba tubo cylindrico, ad 1.2 mm longo, glabro, lobis brevibus. *Fructus* rotundi, ca. 3.5 mm diam., glabrescentes.

FIGURE 60. *Manettia flexilis* Brandegee.—Habit (×½).—B. Flower opened to show interior (×5).—C. Ovary cross section (×7½). [After *D'Arcy & D'Arcy 6616*.]

2. **Manettia flexilis** Brandegee, Univ. Calif. Publ. Bot. 6: 196. 1915. TYPE: México, *Purpus 7118* (UC, holotype).—FIG. 60.

M. estrellae Standley, J. Wash. Acad. Sci. 15: 6. 1925. TYPE: Costa Rica, *Standley 39224* (US, holotype).

Vines, the stems flexuous, the hairs short, curled, white. *Leaves* oblong, ovate oblong or trapeziform, to 5(–7?) cm long, 1.5 cm wide or wider, acute or long attenuate (Standley) at the apex, acute to obtuse at the base, the costa subimmersed above, prominulous to plane beneath, the lateral veins 7–8, arcuate, membranous, glabrous to villosulose above, short pilose or villosulose beneath; petioles slender, to 1 cm long, to 0.5 mm wide, puberulent; stipules not seen. *Inflorescences* axillary, umbelliform, the peduncle reduced, the flowers conglomerate. *Flowers* on short pedicels to 0.5 cm long; hypanthium to 0.5 mm long, densely villose, the calycine cup to 0.4 mm long, the calycine lobes 4, lanceolate, ca. 3 mm long, ca. 0.8 mm wide, venose, the hairs dense and curled outside, at least 1 erect oblong gland to 0.35 mm long at a sinus; corolla white, the tube (in bud) short, villose outside, glabrous inside, the lobes 4, to 3 mm long, ca. 0.7 mm wide, densely villose abaxially; stamens 4, the anthers ca. 0.7 mm long, the filaments short. *Fruits* turbinate, 5–7 mm long, sparsely villose.

Manettia flexilis is known from Guatemala, Costa Rica, Panama and Colombia.

CHIRIQUÍ: 5.4 km from Hato de Volcán on road to Las Lagunas, *Correa & Lazor 1481* (MO). W of Cerro Pando (Río Chiriquí Viejo), *D'Arcy & D'Arcy 6616* (MO). Bajo Mono, Boqueté, *Davidson 468* (MO).

3. **Manettia hydrophila** Dwyer.[69] TYPE: Panama, *Lewis et al. 2822* (MO).

Herbs, often prostrate and procumbent, the stems spreading or erect and weak, the hairs dense, weak, wrinkled, the nodes well spaced. *Leaves* ovate or rhomboid ovate, 2–5 cm long, 1.2–2.8 cm wide, acute toward the apex, basally attenuate acute or subobtuse, often inequilateral, the costa subplane above, plane beneath or scarcely immersed, the lateral veins ca. 6, arcuate, prominulous above, sulcate beneath, membranous, shiny, with minute white cystoliths on both sides, the costa and veins often with appressed uncinate hairs, the margins pubescent; petioles ca. 1 cm long, puberulent; stipules short, widely triangular, ca. 1 mm long, black when dry. *Inflorescences* terminal or axillary and opposite, the peduncle to 1.5 cm long, the cymes contracted, the flowers alternate and well spaced on a flexuous rachis or on 2 branches terminating the peduncle, the branches to 4 cm long. *Flowers* sessile; hypanthium compressed round, ca. 1

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[69] *Manettia hydrophila* Dwyer, spec. nov. *Herba* aquatica nodis rhizophoris caulibus ciliis multis crispis. *Folia* ovata vel rhomboideo-ovata, 2–5 cm longa, 1.2–2.8 cm lata, venis lateralibus ca. 6 arcuatis, membranacea cystolithis multis albis utrinque costa venisque ciliis saepe adpressis uncinatis praeditis; petiolis ca. 1 cm longis; stipulis brevibus lato-triangularibus, ca. 1 mm longis. *Inflorescentiae* terminales vel axillares pedunculo ad 1.5 cm longo, cymis contractis vel cymis floribus solitariis bene distantibus, ad 4 cm longa. *Flores* sessiles lobis calycis 5 ovato-lineari-lanceolatis, ad 2.8 mm longis, ca. 0.4 mm latis; corolla rosea, tubo ad 5 mm longo lobis 4–5, ca. 5 mm longis; antheris ad 1.3 mm longis.

mm long, the hairs appressed, white, the calycine lobes 5, ascending, narrowly linear lanceolate, to 2.8 mm long, 0.4 mm wide, puberulent on both sides with a distinct, red, rotund gland, 0.05 mm long, in the sinuses; corolla rose colored, the tube cylindrical, to 5 mm long, 3 mm wide, glabrous, the lobes 4–5, ovate oblong, 5 mm long, 3 mm wide, obtuse; stamens 4, the anthers oblong, 1.3–1.5 mm long, obtuse at the apex and base, the filaments ca. 1 mm long, attached ca. 1.5 mm from the base, the ovarian disc ringlike, 0.1 mm long, the style much reduced, the stigmas lanceolate, acute. *Fruits* rotund, 3.5 mm in diam., the hairs ascending, uncinate, to 0.5 mm long, drying at first brown, ultimately the surface of the wall deciduous, the remainder scarious, white, smooth; seeds subrotund or oblong, ca. 0.5 mm long, flat, red, shiny.

Manettia hydrophila is known only from Panama. It is unique in being a prostrate or erect aquatic.

VERAGUAS: Mouth of Río Concepción, in swamp, *Lewis et al. 2822* (MO).

4. **Manettia reclinata** L. Mant. Pl. 2: 553. 1771. TYPE: not seen.

Vines, the stems slender, often with longitudinal ridges, glabrate or puberulent. *Leaves* ovate oblong, 3.0–5.5 cm long, 1.0–2.5 cm wide, acute at the apex, often acuminate, the acumen to 1 cm long, basally cuneate to obtuse, slightly inequilateral, the costa plane to prominulous above, prominulous to subplane beneath, the lateral veins 6–7, arcuate, the margin often villosulose, membranous; petioles to 2 cm long, slender, ca. 0.7–1.0 mm wide, puberulent; stipules small, widely triangular, to 1 mm long, wider than long, minutely puberulent and rugulose. *Inflorescences* axillary or terminal, glabrous, 1–several flowers per axil, the peduncle, if present, short, terminated by a pair of bracteoles subtending the pedicels; pedicels capillaceous, to 3.5 cm long. *Flowers* with the hypanthium oblong, ca. 3 mm long, the calycine cup ca. 1 mm long, with minute oblong glands within to 0.15 mm long, the lobes (6–)8, subequal, subulate to narrowly oblong, 6–7 mm long, marginally ciliate; corolla red, scarlet, magenta, occasionally white, the tube ca. 7 mm long, basally turgid, glabrate, minutely puberulent to densely villose outside, densely villose within near the mouth and with a few hairs near the base, the lobes 4, oblong, 7–8 mm long, 3–4 mm wide, obtuse, petaloid, venose, marginally ciliate, glabrous adaxially; stamens 4, the anthers oblong, ca. 3 mm long, the filaments ca. 1 mm long, attached near the mouth; stigmas 2, linear oblong, ca. 2.5 mm long, the style ca. 11 mm long. *Fruits* capsular, compressed rotund, 0.6–0.8 cm in diam., smooth, glabrous or puberulent, each valve with 3 delicate ribs, the calycine lobes persistent, curled; seeds ca. 3 mm in diam., the wing round, the margin undulate.

Manettia reclinata ranges from Mexico to northern South America. It also occurs in Cuba and Jamaica. *Duke 14934* notes that the Indians chew the fruits which stain their teeth black. "Churco-guidave" (Choco). *Sullivan 509* and *Folsom 3891* have an average of 6 calyx lobes and the flowers are described as "white." They may represent a new species.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 254* (MO). Chiriquí Lagoon, *Wedel 1217, 1271, 1669, 1714* (all MO). CANAL ZONE: Between Gatún and Fort Sherman, *Burch et al. 1017* (F, GH, K,

MO, NY, UC, US). Farfan Beach, *Burch et al. 1407* (F, GH, K, MO, NY, UC). Río Indio Hydrographic Station and Natural Bridge, *Dodge & Allen 17485* (MO). Madden Dam, *Dwyer 8389* (MO). Fort Sherman, *Dwyer 8595* (MO). Madden Forest, *Gentry 2819* (MO). Cerro Galera, *Gentry 6664* (MO). Curundú, *Harvey 5196* (MO). Cerro Ancón, *Heriberto 51* (F). Road C-29, 6 km E of Gamboa, *Nee 8992* (MO). 1 km NW of Gamboa on E side of Ammunition Depot, *Nee 9542* (MO). Between Rodman Marine Base and Chorrera, *Nowicke et al. 3591* (MO, UC, VEN). BARRO COLORADO ISLAND: *Croat 4375, 6705, 7467, 12740* (all MO); *Shattuck 159* (F, MO), *486* (MO). 13 mi N of Río San Félix bridge, 800–1200 m, *Croat 33406* (MO). CHIRIQUI: Frances Arriba School, ca. 14 km N of David, *Lewis et al. 684* (MO). 12 mi W of Puerto Armuelles, *Liesner 205* (MO). COCLÉ: La Mesa, *Allen 2345, 2853* (both F); *Croat 37483* (MO); *Folsom 3891* (MO); *Sullivan 509* (MO). DARIÉN: Ridge NW of Yaviza, *Duke 6538* (MO). Río Mortí Hydro Camp, *Duke 15414* (MO). Río Balsa, *Duke & Nickerson 14934* (MO). LOS SANTOS: Headwaters, Río Pedregal, *Lewis et al. 2941* (MO, UC, VEN). Between Tonosí and Macaracas, *Oliver et al. 3545* (MO). PANAMÁ: Between Capira and Potrero, *Dodge & Hunter 8616* (MO). Cerro Campana, *Dressler 3524* (MO). Cerro Jefe, *Duke 8005* (MO). Cerro Campana, *Lewis et al. 1922* (MO), *3313* (MO, UC, VEN); *Kirkbride & Hayden 282* (MO). Between Savannas and Río Yguana, *McBride 2634* (F). El Llano-Cartí Road, 5 km N of Panamerican Highway, ca. 300 m, *Nee 7880* (MO). Bella Vista, *Piper 5338* (F). Cerro Jefe, *Tyson 3423* (MO). SAN BLAS: Opposite Ailigandí, *Lewis et al. 145* (F, GH, K, MO, NY, PA, UC, US). Ustupo, *D'Arcy 9491* (MO). VERAGUAS: Soná, *Allen 1024* (F). 0.2 mi beyond fork in road at Escuela Alto Piedra, road to Río Calovébora, 750 m, *Croat & Folsom 33899* (MO). Mouth of Río Concepción, *Lewis et al. 2841 A* (MO).

57. MITRACARPUS

Mitracarpus Zucc. ex Schultes in R. & S., Syst. Veg. 3. Mant. Pl. 210. 1827. TYPE: *Mitracarpus scaber* Zucc.

Herbs, annual or perennial. *Leaves* usually narrow, often subsessile; petioles united with the stipules to form a setiferous sheath. *Inflorescences* of terminal or axillary heads. *Flowers* minute, 4-merous, the calycine cup short, the lobes unequal; corolla funnel shaped, the lobes 4(–3), valvate; stamens included or somewhat exserted, the anthers dorsifixed. *Fruits* capsular, 2-celled, each cell 1-seeded, transversely or obliquely circumscissile, the calyx persistent; seeds ellipsoid or ovoid, ventrally 4-lobed and with a cruciform groove.

Mitracarpus occurs in Mexico, Central America, South America, the West Indies, and in Africa. It is a genus of about 40 species.

a. Stems with numerous hairs; leaves hairy above; nutlets with a single set of diagonally crossed grooves on ventral face ..... 2. *M. hirtus*
aa. Stems with few hairs; leaves glabrous or glabrescent above; nutlets with a double set of diagonally crossed grooves on ventral face ..... 1. *M. breviflorus*

1. **Mitracarpus breviflorus** A. Gray, Pl. Wright. 2: 68. 1853. Originally "*Mitracarpium breviflorum.*" TYPE: México, *Wright 1120*, not seen.

Herbs to 1.5 dm, branched, the stems slender, angular, sparsely hairy. *Leaves* sessile, usually opposite, occasionally 4–several per node, lanceolate, ovate lanceolate, to 2 cm long, to 0.4 mm wide, the lateral veins few, vague, the blades stiff, scabrid above, otherwise glabrous, glabrous beneath, the margin revolute. *Inflorescences* with heads to 1 cm wide. *Flowers* white. *Fruits* to 3 mm long, glabrous below the line of dehiscence, pubescent above, the horns to 2 mm long, unequal, pubescent, the seeds oblong, ca. 0.5 mm long, with 2 diagonally crossed grooves on the ventral surface.

Mitracarpus breviflorus is known from Arizona, Mexico, Costa Rica, and

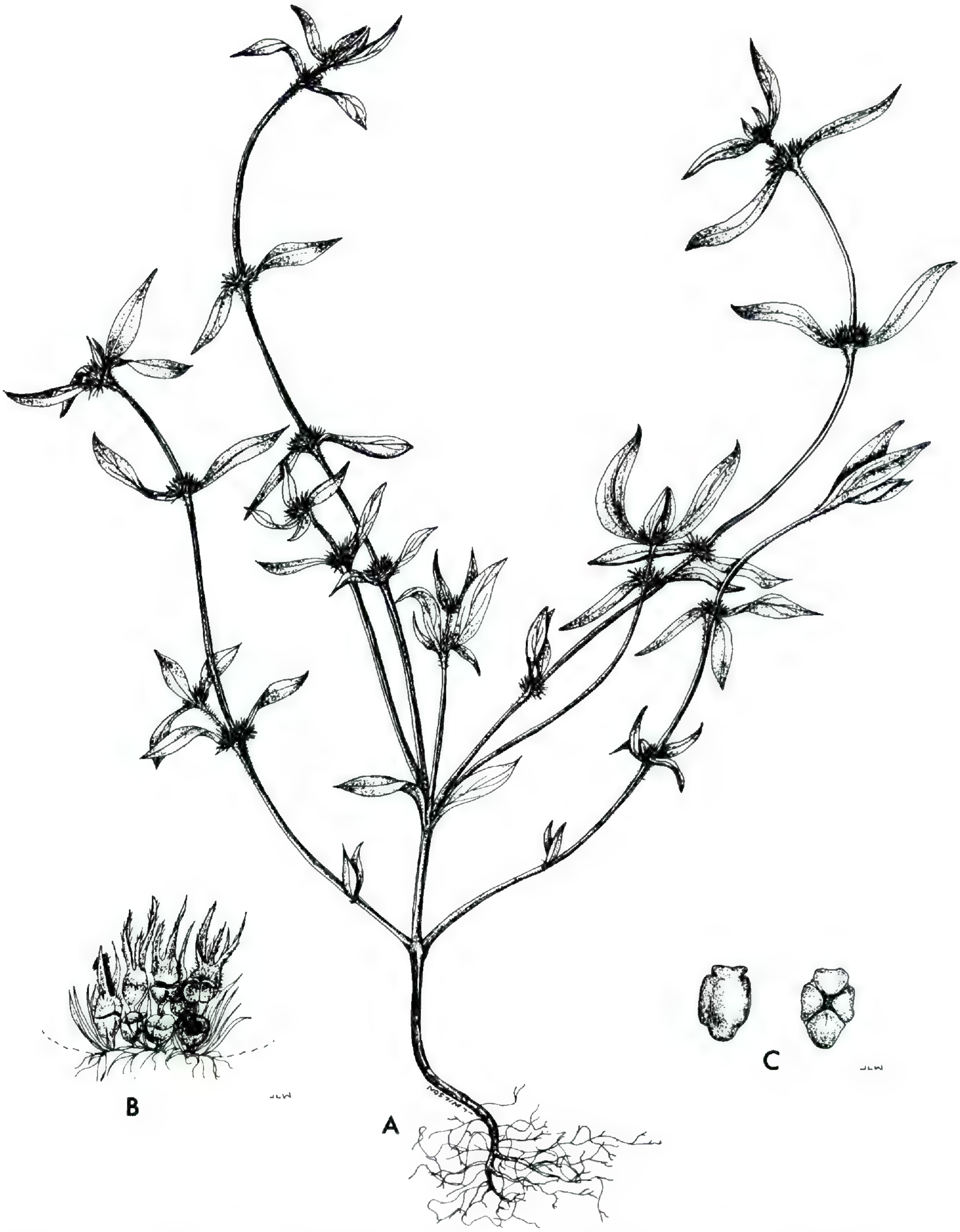

FIGURE 61. *Mitracarpus hirtus* (L.) DC.—A. Habit (×$^{2}/_{5}$).—B. Inflorescence (×$2^{4}/_{5}$).—C. Seeds (×8). [After *Duke 3962*.]

Panama. Johnston et al. (1949) made several collections of the species on San Jose Island which were not seen in this study. The double set of grooves on the face of the nutlet is diagnostic.

CHIRIQUÍ: Lava flow between El Hato and Bambito, *D'Arcy 10041* (MO).

2. **Mitracarpus hirtus** (L.) DC., Prodr. 4: 572. 1830.—FIG. 61.

Spermacoce hirta L., Sp. Pl., ed. 2. 148. 1762. LECTOTYPE: ?Jamaica, Herb. Linnaeus (LINN 125.4, not seen; microfiche MO).
Mitracarpus brevifolius Gray, Pl. Wright. 2: 68. 1853. TYPE: México, *Wright 1120*, not seen.

Herbs to 0.5 m tall, the stems simple or branched basally, angular, glabrescent to villose, the hairs white, weak. *Leaves* lanceolate or oblong, 5(–6) cm long, to 1.5 cm wide, deltoid to acute at the apex, attenuate acute at the base, the costa prominulous above, subprominent beneath, the lateral veins 3–4, often evanescent, arcuate, strongly ascending, chartaceous, usually concolorous, glabrous to pubescent above, the hairs short, stiff, scabridulous; petioles short or absent; stipules connate, adnate to petiole, each part crescentic or hemispherical, to 4 mm long, the terminal margin with 8–10 subulate setas as long as or slightly longer than the sheath. *Inflorescences* terminal and axillary, the flowers in subrotund heads, to 0.7 cm in diam., burrlike because of the persistent, stiff calycine lobes and bracteoles; bracteoles numerous, subulate or linear triangular, erect, shorter than the capsule. *Flowers* very small; hypanthium short, the calycine lobes 4, unequal, lanceolate or subulate, to 1.5 mm long, pellucid, thickly and scarious marginate, the margin with well spaced, subulate hairs, with several oblong glands aggregated below the middle; corolla white, the tube cylindrical, often turgid, ca. 1.8 mm long, the lobes 4, ca. 0.6 mm long, pubescent marginally; stamens 4, the anthers oblong rotund, ca. 0.45 mm long, glandular apiculate, sessile or attached near the mouth; stigmas 2, minute, often exserted. *Fruit* a circumscissile capsule, ca. 1 mm long (exclusive of persistent calyx), dehiscing uniformly to expose the seeds, the cap hairy, the seeds quadrangular, brown, pitted.

Mitracarpus hirtus is a common weed throughout tropical America and the West Indies but has been collected only sporadically in Panama. It is naturalized in Asia and Malaysia. Steyermark (1972) has an elaborate discussion of the typification of *M. hirtus* in his remarks on *M. villosus* (Sw.) C. & S.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 373* (F). CANAL ZONE: Albrook, *Blum 449* (MO). Summit Gardens, *Croat 6761* (MO). Ft. Kobbe, *Duke 3962* (MO). Railroad 3 km W of Gamboa, *Nee 9505* (MO). CHIRIQUÍ: Lava flow between El Hato and Bambito, *D'Arcy 10041* (MO). COCLÉ: Boca del Toabre, confluence of Río Toabre and Rio Cocle del Norte, *Lewis et al. 5487* (MO). DARIÉN: Río Mortí, 6 mi upstream from Mortí Abajo, *Duke 10161* (MO). Río Tuquesa, lower Tuquesa mining company camp called Charco Chiva, *Mori 6968* (MO). PANAMÁ: Isla Taboga, *Allen 1273* (MO). Cerro Azul, *Tyson 2067* (MO). VERAGUAS: 0.2 mi beyond fork in road at Escuela Agricola Alto Piedra, road to Río Calovébora, 750 m, *Croat & Folsom 33868* (MO).

58. MONTAMANS

Montamans Dwyer.[70] TYPE: Panama, *M. panamensis* Dwyer.

Succulent *herbs*. *Leaves* large, the lateral veins numerous, petioles elongate; stipules free, 2-awned. *Inflorescences* axillary, cymose, sessile or short pedun-

[70] *Montamans* Dwyer, gen. nov. *Herbae* succulentae. *Folia* magna, venis lateralibus crebris. *Inflorescentiae* axillares, cymosae floribus in caespitem parvum congestis bracteis 2-seriatim dispositis. *Flores* lobis calycinis polymorphis elongatis; corolla tubo cylindrico, lobis 5 utroque lobo

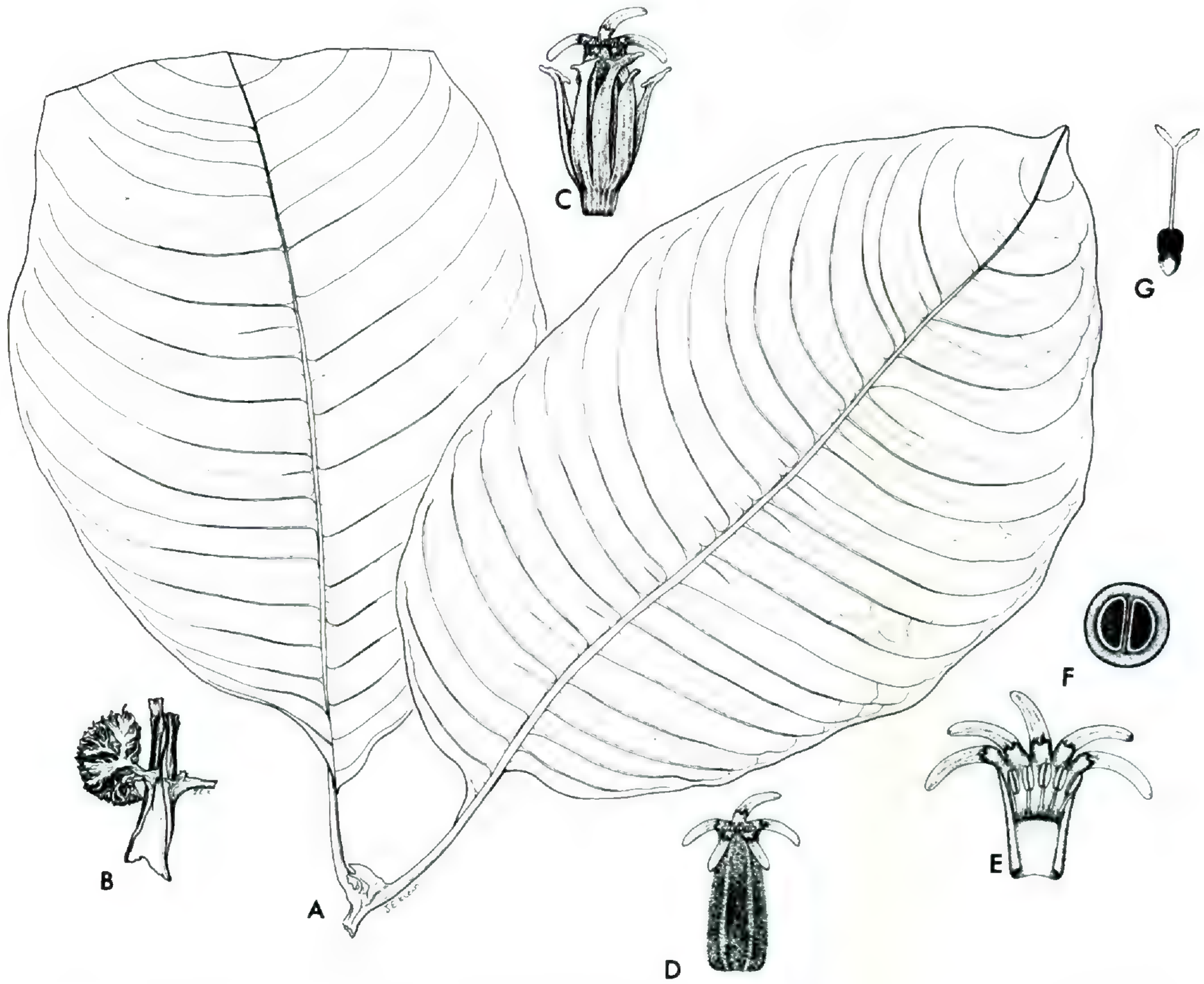

FIGURE 62. *Montamans panamensis* Dwyer.—A. Leaves (×½).—B. Inflorescence (×½).—C. Flower (×6).—D. Flower with calyx removed (×6).—E. Corolla opened to show interior (×10).—F. Ovary cross section (×10).—G. Style (×10). [After *Dwyer 7711*.]

culate, the flowers congested into a head; bracts disposed in 2 series, often galeate or 2-horned at the apex. *Flowers* with the calycine lobes elongate, polymorphic especially at the apex; corolla cylindrical, short, the 5 lobes bearing a galeate horn at the apex; stamens 4–5, the anthers and filaments short, attached near the middle of the tube; style slender, the stigmas 2, slender, the ovary 2-celled, the septum thick, with a single ovule in each cell arising from the base. *Fruits* rotund, fleshy, with two plane pyrenes.

Montamans is known only from Panama. The new genus is obviously a member of the tribe Psychotriae as is evidenced by its 2-celled ovary with a thick septum and basally attached ovule in each cell, and by its fleshy fruit with 2 pyrenes. It is distinguished from the other genera of the tribe (*Psychotria*, *Cepha-*

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cornu galeatum ferentibus; antheris et filamentis brevibus prope medium tubum affixis; ovario bilocellato septo medio crasso ovulis 2 basaliter affixis. *Fructus* rotundi carnosi pyrenis 2 plano-compressis.

elis, *Palicourea*, etc.) by its elongate, polymorphic and galeate calycine lobes and by its corolla lobes with a solid obtuse reflexed cylindrical horn below the apex.

1. **Montamans panamensis** Dwyer.[71] TYPE: Panama, *Dwyer & Lallathin 8792* (MO, holotype).—FIG. 62.

Succulent *herbs* to 1¼ m tall, the stems terete, dark green, nodose, glabrous, to 1.5 cm in diam. *Leaves* oblong rotund to widely oblong, to 35 cm long, to 20 cm wide, triangular deltoid toward the apex, often round or obtuse at the base, cuneate, sometimes inequilateral, the costa prominulous above, plano compressed beneath, the lateral veins ca. 25, widely arcuate, often with a vein between a pair of lateral veins, the intervenal areas spreading reticulate, thinly succulent, chartaceous when dry, somewhat discolorous, glabrate above and beneath except for the veins which are sparsely pubescent beneath; petioles to 5 cm long, to 0.3 cm wide, the scars of the petioles hemispherical; stipules tending to persist at the tip of the stem, free, thick, 2-awned, with the awns spreading, triangular, equaling the body, auriculate toward the base. *Inflorescences* sessile, axillary or on short peduncles, the heads of flowers to 4.5 cm wide, wider than long; bracts arranged in 2 series, the outermost bracts to 14 mm long, 3–8 mm wide, wider toward the apex, polymorphic and often triangular galeate or bifid for ca. 2 mm; bracteoles linear lanceolate, to 9 mm long, galeate. *Flowers* with the hypanthium ca. 1 mm long, often yellow, the calyx lobes 5(–6), unequal, often narrowly lanceolate and falcate, some compressed galeate toward the apex, to 5 mm long, carnose, minutely diffusely pubescent, the galeate projections to 2 mm long, briefly connate at the base; corolla white, the tube cylindrical, to 6 mm long, slightly inflated above the middle, a few short, glandular hairs outside, white villose within the area of filament attachment, the lobes 5, spreading at anthesis, triangular, to 5 mm long, acute, each lobe with a galeate process just below the tip, the process cylindrical, solid, obtuse, reflexed, to 4 mm long, at maturity shorter than the tube; stamens (4–)5, the anthers oblong, to 1 mm long, the filaments ca. 1 mm long, attached near the middle of the tube; ovary often split in the middle, to 1 mm in diam., 2-celled, the septum thick, the ovules 2, subplane, attached basally, the style cylindrical, to 5.5 mm long, the stigmas 2, suberect, slightly unequal, 0.8–1.3 mm long, slightly wider than the style; ovarian disc yellow, annular. *Fruits* white, rotund, to 6 mm in diam., carnose, smooth, glabrous with 10 slender longitudinal veins, the pyrenes 2, plano compressed, the wall thin; seeds 2.

Montamans panamensis is known only from Panama.

CHIRIQUÍ: Cerro Horqueta, *Blum & Dwyer 2648* (MO). Río Chiquero, *D'Arcy 10985* (MO). Cerro Horqueta, *Dwyer & Hayden 771* (MO); *Dwyer & Lallathin 8972* (MO); *Kirkbride 145* (MO).

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[71] *Montamans panamensis* Dwyer, spec. nov. *Herbae* succulentae. *Folia* magna, venis lateralibus ca. 25; petiolis ad 5 cm longis; stipulis liberis 2 setis praeditis. *Inflorescentiae* axillares sessiles vel subsessiles floribus in caespitem ad 4.5 cm latum congestis; bracteis 2-seriatim dispositis polymorphis ad 14 mm longis. *Flores* lobis calycis 5(–6) polymorphis, ad 5 mm longis; corolla tubo ad 6 mm longo, lobis 5, ad 5 mm longis, lobo utroque cornu galeatum vix infra apicem ferente; antheris ad 1 mm longis; ovario bilocellato ovulis 2 basaliter affixis. *Fructus* albi rotundi ad 6 mm diam., carnosi laeves pyrenis 2 plano-compressis.

FIGURE 63. *Morinda citrifolia* L.—A. Habit (×½).—B. Flower opened to show interior (×4½). [After *Holdridge 6507.*]—C. Fruits (×½). [After *Porter et al. 5016.*]

59. MORINDA

Morinda L., Sp. Pl. 176. 1753. LECTOTYPE: *M. rojoc* L.

Shrubs or small trees. *Leaves* opposite, occasionally ternate, petiolate; stipules interpetiolar, connate, persistent, usually bifid. *Inflorescences* terminal or axillary, the peduncles present or absent, the flowers in small heads. *Flowers* with hypanthium and calyx of adjacent flowers partially or completely united; calyx truncate, the teeth obscure; corolla infundibuliform or hypocrateriform, the lobes 4–7, valvate; stamens 4–7, the anther connectives produced at the apex; ovary 2–4-celled, each with an ascending ovule attached near the base of the cell. *Fruit* a syncarp, often large, fleshy and white, each cell with a 2-celled pyrene.

Morinda is well distributed in the tropical areas of the world. It is a genus of about 80 species, a few of which are a source of dyestuffs. For more detail on the structure of the fruits and seeds see Hayden & Dwyer (1969).

Literature:

Hayden, M. V., & J. D. Dwyer. 1969. Seed morphology in the tribe Morindeae. Bull. Torrey Bot. Club 96: 704–710.

a. Leaves 1.7–4.0(–5.0) cm wide ---------- 3. *M. rojoc*
aa. Leaves 5–12 cm wide.
  b. Largest leaves exceeding 20 cm in length; corolla lobes more than 6 mm long; fruit 9 cm wide or wider ---------- 1. *M. citrifolia*
  bb. Largest leaves less than 20 cm long; corolla lobes 2.5–5.0 mm; fruits 1.0–2.5 cm wide ---------- 2. *M. panamensis*

1. **Morinda citrifolia** L., Sp. Pl. 176. 1753. TYPE: Herb. Linn. (LINN. 236.1, not seen; microfiche MO).—FIG. 63.

Trees or shrubs to 25 ft tall, the branchlets 4-angled, glabrous, the nodes well spaced. *Leaves* oblong, 14–30 cm long, 12–18 cm wide, obtuse to acute at the apex, widely cuneate at the base, often slightly inequilateral, the costa grooved and subimmersed above, prominulous but appearing subplane beneath, to 0.3 cm wide proximally, the lateral veins ca. 8, prominulous, arcuate, the median veins to 5 cm apart, chartaceous to papyraceous, concolorous, glabrous or punctate above, glabrous beneath except the barbate vein axils; petioles to 2 cm long; glabrate, slightly alate adaxially; stipules oblong or oblong rotund, 10–20 mm long, 10–20 mm wide at the base, scarious, glabrous, appressed. *Inflorescences* axillary, glabrous, drying black, the peduncles 1–4, stout, to 3 cm long, the floral masses rotund to oblong, to 2 cm in diam. *Flowers* sessile, the hypanthium hidden in the floral mass, the calycine cup short, truncate, the margins scarious, the lobes evanescent, glabrous; corolla white, the tube cylindrical, ca. 6 mm long, carnose, glabrous outside, villose inside near the mouth, the lobes 5, narrowly oblong, to 9 mm long, 1.5 mm wide, obtuse, carnose, glabrous; stamens 5, long exserted at anthesis, the anthers subversatile, linear oblong, to 5.5 mm long, twisted and crescentic on shedding pollen, the filaments slightly unequal in length, inserted at the corolla mouth; stigmas 2, spread at anthesis, plumose in appearance, narrowly oblong, to 5.2 mm long, 0.8 mm wide, the margin erose. *Fruits* fleshy, succulent, as large as a man's hand, drying black.

The range of *Morinda citrifolia* is India, Malaya, and tropical Australia; it has become naturalized in the West Indies and occurs sporadically in Central America. The large succulent white fruit bears a resemblance to large edible fruits of *Annona*.

The collection *Dwyer & Lallathin 8794* has the following notes: "Flowers with yellow-green corolla tube, the lobes spreading to slightly reflexed, the lobes brown on the upper surface; fruits at maturity china white with distinct golden green 'eyes' (ovarian discs and calycine cups), to 0.8 cm in diam.; stipules green, to 2 cm wide; flowers to 1.5 cm long." *Duke & Bristan 333* notes that *M. citrifolia* is used medicinally by the Cuna of Darien.

BOCAS DEL TORO: Isla Colón, Chiriquí Lagoon, *Wedel 2942* (F, G). CANAL ZONE: Boyd Roosevelt Highway, 5 mi W of Sabanita, *Croat 14074* (MO). Between Gatún and Fort Sherman, *Croat 15403* (MO). Summit Garden, *Croat 16645* (MO). Coco Solo, *Dwyer & Duke 7906* (COL, MO, UC, VEN). Fort Clayton, *Dwyer & Lallathin 8794* (MO). Mouth of Río Chagres, *Johnston 1771* (MO). Summit Garden, *Nee 7046* (MO). Fort San Lorenzo, *Porter et al. 5016* (MO). COLÓN: Portobelo, *Croat 14127* (MO). María Chiquita, *Dwyer 5018* (MO). Salúd, *Holdridge 6507* (MO). Quebrada Santa Marta, coast road 4½ km SW of Piña, *Nee 11701* (MO). SAN BLAS: Ailigandí River, *Duke & Bristan 333* (MO).

2. **Morinda panamensis** Seem., Bot. Voy. Herald 136. 1854. TYPE: Panamá, *Fendler 148* (MO, isotype).

Trees or shrubs to 25 ft tall, the branchlets 4-angled, farinose puberulent or glabrescent, the nodes well spaced. *Leaves* oblong, ovate oblong or oblong rotund, 9–20 cm long, 5–15 cm wide, deltoid or rounded at the apex, shortly acuminate, the acumen to 1 cm long, basally cuneate, often attenuately so and equilateral, the costa slender above, plane, prominulous or subimmersed above, the secondary veins 6–9, arcuate, to 3(–4) cm apart, chartaceous, glabrous or farinose above, pubescent or farinose beneath, rarely totally velutinous pubescent, the hairs often restricted to the axils and costa; petioles to 2.5 cm long, occasionally absent, farinose puberulent; stipules deltoid or oblong rotund, 6–10 mm long, 6–9 mm wide, often wider than long, the peduncles ascending, 1.5–5.5 cm long, 1.5–5.0 mm wide, glabrescent, often farinose, terminated by 3–4 equal or unequal branches, to 3 cm long, each with a subrotund capitulum, 0.5–1.0 cm wide. *Flowers* sessile; hypanthium subrotund, truncate, ca. 1.8 mm long, minutely puberulent, the calycine tube to 1 mm long, the teeth absent or reduced to points; corolla white, the tube cylindrical, 7–8 mm long, thickly petaloid, minutely puberulent outside, villose inside above the middle, the lobes 4, valvate, thick, triangular in cross section, narrowly oblong, 2.5–5.0 mm long, tapering narrowly toward the apex, vaguely to obviously cordate at the base; anthers narrowly oblong, ca. 2.5 mm long, obtuse, the filaments inserted near the mouth; stigmas 2, digitiform, 3.5–5.0 mm long, erect, the ovary rectangular in cross section, the wall moderately thick, the septum thin, 2-loculate, the ovules one per cell. *Fruits* disposed in a capitulum, to 2.5 cm in diam.

Morinda panamensis ranges from tropical Florida to Mexico, Central America, and the West Indies.

CANAL ZONE: Fort Lorenzo, *Hayden 101* (MO); *Porter et al. 4985* (MO, SCZ, UC, VEN), *5016* (COL, DUKE, MO, SCZ, UC, VEN), *5017* (COL, DUKE, MO, NY, SCZ, UC, VEN); *Tyson &*

Blum 3692 (MO). Gatún Locks to Fort Sherman, *Tyson 3756* (MO). Chagres River Landing, near Fort San Lorenzo, *Tyson & Nee 7310* (MO). COCLÉ: Cerro Pilón, El Valle, *Duke & Dwyer 13894* (MO). COLÓN: Salud, *Holdridge 6507* (MO). Salud and Boca de Río Indio, *Howell 84* (MO). Palenque, *Pittier 4121* (F). DARIÉN: El Real to Pinogana *Duke 5000* (MO). Yaviza near Río Chucunaque, El Punteadero, *Stern el al. 171* (MO). PANAMÁ: Chagres, *Fendler 148* (MO, US). 16–18 km from the Panamerican Highway, El Llano-Cartí Road, *Tyson & Nee 7321* (MO). SAN BLAS: Mulatuppo, *Duke 8510* (MO). Mandinga, *Duke 8924* (MO).

3. **Morinda rojoc** L. Sp. Pl. 176. 1753. TYPE: not seen.

M. yucatanensis Greenm. Publ. Field Columbian Mus., Bot. Ser. 2. 262. 1907. TYPE: Mexico, *Gaumer 362* (F, holotype).

Shrubs, often scandent, to 2 m tall; branchlets angular, smooth, glabrous, cracking, often drying tan, the nodes well spaced. *Leaves* oblong, obovate oblong or narrowly obovate oblong, often falcate, 4.0–15.5 cm long, 1.7–4.0(–5.0) cm wide, usually 4 times longer than wide, acute or attenuate acute at the base, the costa slender and prominulous above, prominent beneath, the lateral veins 5–7, strongly arcuate, prominulous, the intervenal areas smooth, the veinlets usually evanescent, papyraceous, glabrous above but minutely farinose or punctate, barbate along the costa, often farinose or punctate beneath, the margin slightly involute; petioles to 0.5 cm long, slender, ca. 1 mm wide, glabrous; stipules triangular, to 4 mm long, ca. 5 mm wide at the base, the median awn subulate, about the same length as the body. *Inflorescences* axillary, solitary, the peduncle to 0.3 cm long, stout, puberulent, the terminal head of flowers ca. 0.5 cm in diam. *Flowers* with the hypanthium cupuliform, ca. 1 mm long, the calycine cup ca. 0.35 mm long, glabrous, the margin undulate, the lobes 5, indistinct, obtuse, puberulent; corolla white, the tube cylindrical, ca. 5 mm long, ca. 2 mm wide, carnose, glabrous outside, densely white villose inside above the middle, the lobes as long as the tube; stamens 5–6, the anthers ca. 2 mm long, obtuse, the filaments slender; stigmas 2, ca. 1.5 mm long, the style ca. 3 mm long. *Fruits* rotund, 1–2 cm in diam.

Morinda rojoc occurs in Florida, Mexico, Central America, the West Indies, and northern South America. It is interesting that all of the Panama collections of the species were made on or near beaches.

COLÓN: Guaira (mainland opposite Isla Grande), *d'Arcy 4053* (MO). SAN BLAS: Mulatuppu (Río Ibedí), *Duke 8510* (MO). Airport at Irandí, *Duke 6511* (MO). Mulatuppu, *Duke 8520* (MO). Isla de Soskatupu, *Duke 8966* (MO). Narganá Island, *Gentry 1514* (MO). Isla Ustupo, W of Playon Chico, *Gentry 6338* (MO). Isla de Soskatupu, *Kirkbride 178, 187A* (both MO). Narganá, *Tyson & Dwyer 1173* (MO).

60. NERTERA

Nertera Banks & Soland. ex Gaertn., Fruct. Sem. Pl. 1: 124. 1788, nom. cons. TYPE: *N. depressa* Gaertn. = *N. granadensis* (L.f.) Druce.

Gomozia Mutis ex L.f., Suppl. Pl. 17, 129. 1781, nom. rejic. TYPE: *G. granadensis* L.f.
Gomosia Lam., Encycl. Méth. Bot. 2: 769. 1788, *Gomozia* Mutis, ex L.f. orth. mut.
Gomoza Cothen., Disp. Veg. Meth. 5. 1790, *Gomozia* Mutis, ex L.f. orth. mut.

Creeping, perennial *herbs*, often forming mats. *Leaves* small, often subsessile; stipules minute, adnate to the petioles, the sheath entire or with 2 teeth. *Flowers*

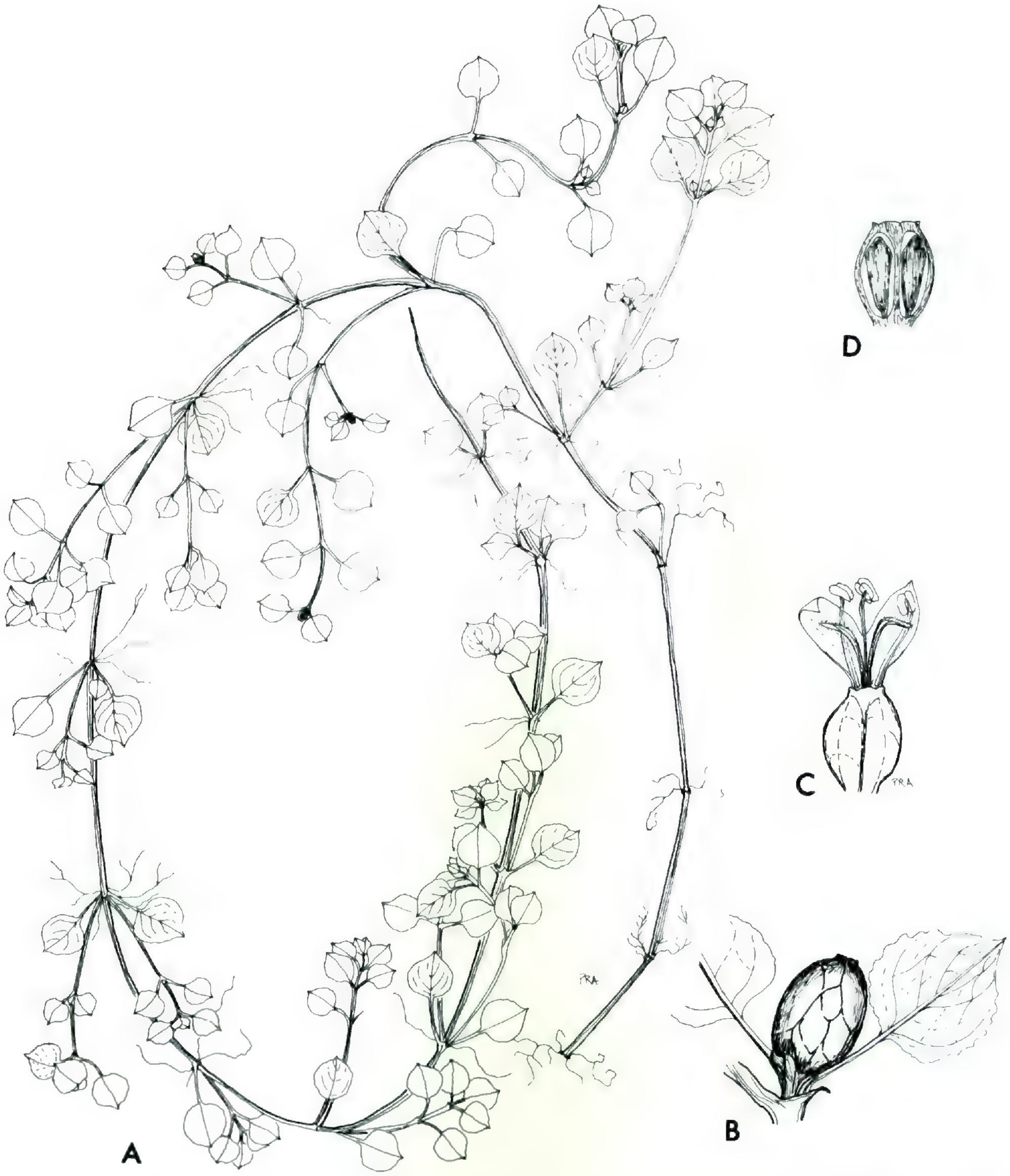

FIGURE 64. *Nertera granadensis* (L. f.) Druce.—A. Habit (×½).—B. Fruit (×6). [After *Croat 13778.*]—C. Flower opened to show interior (×10).—D. Ovary longitudinal section (×9). [After *Croat 620*, Costa Rica.]

minute, axillary, sessile, usually perfect; calyx truncate or tubular, the teeth 4–5; corolla tubular or funnel shaped, glabrous within, the lobes 4, valvate; stamens 4, attached basally to the corolla, the anthers apiculate, exserted; ovary 2-celled, the style long exserted, hairy, the ovules solitary, erect from the base of the cell. *Fruits* rotund, succulent, red, with 2 cartilaginous nutlets.

Nertera is distributed in Mexico through Central America, South America, and the West Indies. It also occurs in Australia, New Zealand, and the East Indies, as well as in Hawaii.

1. **Nertera granadensis** (L.f.) Druce, Bot. Soc. Exch. Club Brit. Isles. 1916: 637. 1917.—FIG. 64.

Gomozia granadensis Mutis ex L.f., Suppl. Pl. 129. 1781.
Nertera depressa Banks & Sol. ex Gaertn., Fruct. Sem. Pl. 1: 124. 1788. TYPE: Antartica, *Banks* (K, holotype), not seen.

Herbs, epiphytic or creeping, occasionally to 1.3 m tall, the branches short, glabrous or webby pubescent (mouldy?), often drying deep purplish red. *Leaves* ovate rotund, to 1.3 cm long, to 1.25 cm wide, slightly inequilateral, widely deltoid at the apex, ultimately retuse or minutely apiculate, basally subcordate to truncate, the base deltoid as it passes into the petiole, the costa plane or evanescent above (then often pubescent), plane to prominulous beneath, the lateral veins 2–5, often evanescent, the 2 basal veins together with the costa appearing flabellate, widely arcuate, carnose but drying thin, glabrous or pubescent, the hairs thick, falcate, appressed, often only the hair bases persistent and the surface then silvery lepidote, the margin delicately marginate; petioles 0.9 cm long, to 0.3 cm wide, glabrous, often grooved above; stipules interpetiolar, triangular, to 1 mm long, to 1 mm wide. *Flowers* solitary; hypanthium oblong, ca. 1 mm long, with a few scattered hairs, the calycine cup short and without lobes; corolla yellow green or pale yellow, the tube widely funnel shaped, inflated, ca. 0.8 mm long, glabrous, petaloid; stamens 4, the anthers rotund, ca. 0.3 mm in diam., the filaments ca. 1.5 mm long, inserted at the base of the corolla tube; stigmas 2, reflexed, subulate, ca. 1 mm long, longer than the style, the ovule 1, large, pendent. *Fruits* sessile, scarlet at maturity, oblong, to 2.5 mm long, to 2 mm wide, glabrous, delicately reticulate and with a few delicate longitudinal lines, the raphides abundant.

Nertera granadensis ranges from Mexico to Chile. Index Kewensis lists the species as occurring in New Zealand and the Island of Tristan da Cunha.

CHIRIQUÍ: Cerro Horqueta, *Blum & Dwyer 2613* (MO). Las Cumbres, Cerro Punta, *Croat 13778* (MO); *Croat & Porter 16117* (MO). Alto Respinga and above, ca. 2800 m, *D'Arcy 9958* (MO). Above Bajo Chorro, *D'Arcy 11092* (MO). Bajo Chorro, Boquete, *Davidson 422* (F, MO). Potrero Muleto, Volcán de Chiriquí, Boquete, *Davidson 1038* (F, MO). Between Quebrada Hondo and divide on Calderas-Chiriquicito trail, *Kirkbride & Duke 930* (MO). Las Nubes, W of Cerro Punta, *Liesner 291* (MO). E side of Volcán Barú, 3000 m, *Mori & Bolten 7437* (MO). Bajo Grande, ca. 3 km E of town of Cerro Punta, 2200 m, *Nee 9977* (MO). Cerro Punta, 6800 ft, *Ridgway & Solis 2397* (MO). Río Chiriquí Viejo Valley, near Volcán, *White 170* (MO). Río Chiriquí, Viejo Valley, *White 219* (F). Loma Larga, Volcán de Chiriquí, *Woodson et al. 1032* (F, MO). DARIÉN: Cerro Tarcarcuna, W ridge along Quebrada toward waterfall, 1500–1550 m, *Gentry & Mori 14104* (MO).

61. OLDENLANDIA

Oldenlandia L., Sp. Pl. 119. 1753; Gen. Pl., ed. 5: 55. 1754. LECTOTYPE: *O. corymbosa* L.

Herbs or rarely subshrubs. *Leaves* callose mucronate at the apex; stipular sheath adnate to the petiole. *Inflorescences* terminal or pseudo axillary, flowers solitary at the nodes or clustered. *Flowers* 4-merous, isostylous or heterostylous, the calycine cup dentate; corolla tube often short, often barbate at the mouth; stamens inserted at the base of the corolla lobes or well into the tube, the anthers dorsifixed; style glabrous or pubescent, the stigmas 2, subglobose or elongate, the ovary 2-celled, the ovules numerous on a peltate placenta. *Fruits* capsular,

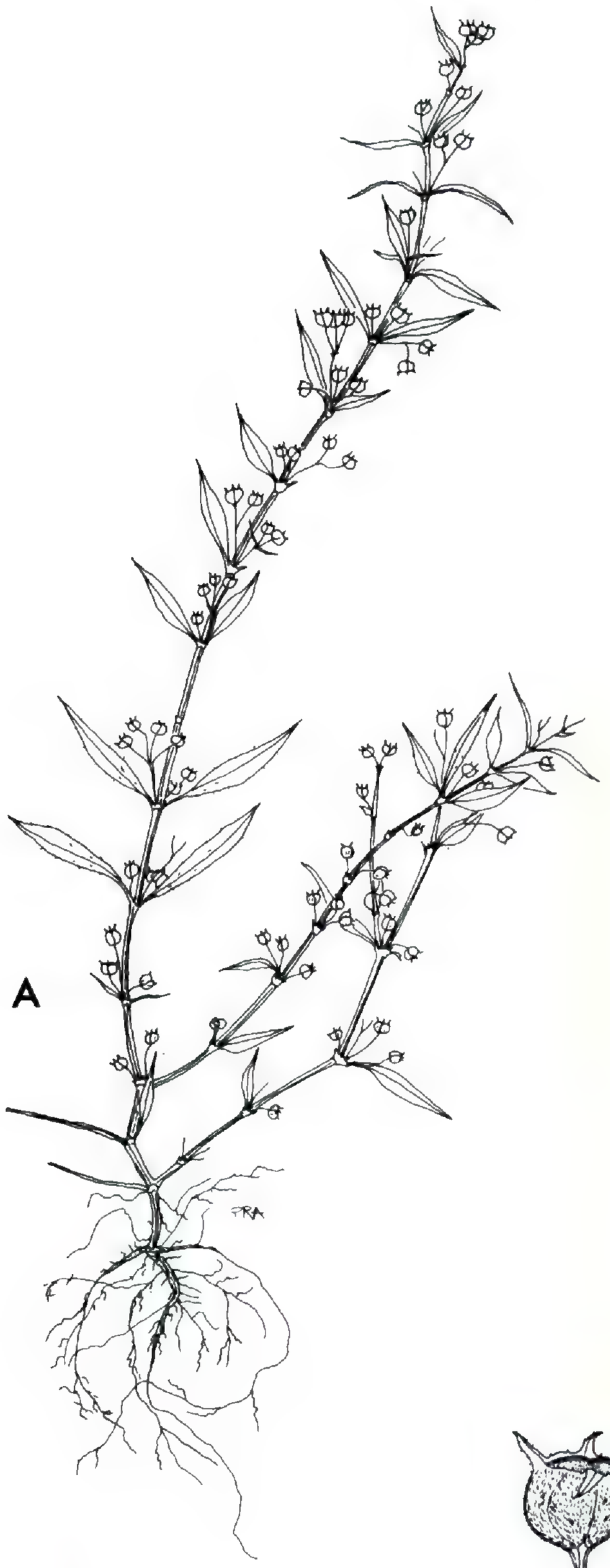

FIGURE 65. *Oldenlandia corymbosa* L.—A. Habit (×½). [After *Lewis et al. 781.*]—B. Fruiting calyx (×4½).—C. Seeds (×4½). [After *Fendler 10.*]—D. Flower, part of the perianth removed (×4½).—E. Flowering calyx (×4½). [After *Lewis 41.*]

the wall horny, sometimes produced within the calyx into a beak and there dehiscing loculicidally by a cleft; seeds usually numerous, subglobose or angular, smooth or alveolate.

Oldenlandia occurs throughout warmer areas of the world. It is a genus of about 300 species.

a. Leaf blades to 0.3 cm long ..... 1. *O. callitrichoides*
aa. Leaf blades 1.5–5.5 cm long.
  b. Leaves with lateral veins evanescent; flowers 1–5 ..... 2. *O. corymbosa*
  bb. Leaves with lateral veins visible; flowers solitary ..... 3. *O. lancifolia*

1. **Oldenlandia callitrichoides** Griseb., Mem. Am. Acad. n.s. 8: 506. 1863. TYPE: Cuba, *Wright 268, 1640,* not seen.

Prostrate *herbs* disposed as a mat, or erect to 10 cm tall, the stems smooth, glabrous, to 0.3 mm wide, branching profusely, the nodes usually well spaced. *Leaves* with a spathulate appearance because of elongate petioles, the blades ovate, rhomboid ovate to oblong, to 3 mm long, to 2 mm wide, acute or obtuse at the apex, cuneate, obtuse or rounded at the base, the lateral veins delicate, 3–4, often evanescent, membranous, concolorous, drying green, glabrous; petioles shorter than or about as long as the blade; stipules adnate to the petiole base, often with a few dark red glands on the surface or on the margin, often with a narrowly oblong deciduous appendage to 0.5 mm long. *Flowers* not seen but apparently solitary in the axils. *Fruits* with pedicels to 3 mm long, the body ca. 3 mm long (including calyx), truncate, smooth, glabrous except on teeth, raphides abundant, the persistent calycine lobes apparently 5, triangular oblong, to 0.6 mm long.

Oldenlandia callitrichoides occurs sporadically in the tropics of the New World. This species has the smallest leaves of all the Panamanian Rubiaceae.

COLÓN: Between Garotte and La Guiara, *D'Arcy 9378* (MO). PANAMÁ: On stone wall near sidewalk, Calle Estudiante, Panama City, *D'Arcy 10190* (MO).

2. **Oldenlandia corymbosa** L., Sp. Pl. 119. 1753. TYPE: not seen; cited by Linnaeus as in "Trop. Meridionalis."—FIG. 65.

Herbs, prostrate or erect, to ⅓ m tall, sparsely to much branched, the branches lax, glabrous, shiny. *Leaves* narrowly oblong or linear, 1.5–2.0(–3.0) cm long, to 0.45 cm wide, deltoid to acute at the apex, cuneate at the base, the costa evanescent above or barely visible, scarcely prominulous beneath, the lateral veins evanescent, the margin scabridulous, with some proximal papillae, thinly carnose, concolorous, glabrate beneath; petioles to 1 mm long, inserted in the sheath of the connate stipules; stipules cupuliform or obconical, to 2.5 mm long, the cup with several ascending or deflexed glandular fimbriae of unequal length, often exceeding the sheath in length. *Inflorescences* mostly at the nodes, the flowers solitary or often 2 or 3, infrequently disposed in corymbs of 4–5 flowers, the peduncles filiform, usually about ½ as long as the leaves, the pedicels filiform, shorter or longer than the peduncle. *Flowers* isostylous with the hypanthium small, the calycine lobes 4, triangular, to 1.1 mm long, scabrid marginate; corolla lavender or white, the tube ca. 0.6 mm long, the lobes 1–2 mm long; stamens 4,

the anthers sessile, rotund, inserted on upper ½ of the tube, the pistils glabrous. *Fruits* capsular, to 2.5 mm wide, truncate at the apex, subplane; seeds 1 per carpel, round, ca. 0.5 mm wide, areolate.

Oldenlandia corymbosa is native to Africa, occurring throughout the continent. It was probably introduced into the New World in the 15th century and has spread throughout tropical America.

BOCAS DEL TORO: Bocas del Toro Island, *Lewis et al. 781* (GH, K, MO, US, UC). Changuinola, *Lewis et al. 796* (GH, MO), *804* (GH, MO, UC, US). CANAL ZONE: Frijoles, *Croat 6077* (MO). E of Gatún Locks, *Duke 4297* (MO). Toro Point, Fort Sherman, *Duke 4342* (MO). Chagres, *Fendler 10* (MO). Madden Dam, *Lewis et al. 5365* (COL, MO, SCZ, UC, VEN). Road 3 km SE of bridge, Gamboa, *Nee 9434* (MO). Road 2 km NW of Summit Gardens, 80 m, *Nee 9431* (MO). Balboa, *Standley 25660* (MO). Summit, *Standley 26970* (MO). BARRO COLORADO ISLAND: *Croat 6800, 7055* (both MO); *Ebinger 39* (MO); *McDaniel 5024* (MO). COCLÉ: El Valle, *Lewis et al. 2507* (COL, DUKE, MO, UC). COLÓN: Mouth of Río Piedras, *Lewis et al. 3170* (COL, DUKE, MO, UC, VEN). PANAMÁ: 2 km W of El Llano, *Nee 7961* (MO).

3. **Oldenlandia lancifolia** (Schum.) DC., Prodr. 4: 425. 1830.

Hedyotis lancifolia Schum. in Schum. & Thonn., Beskr. Guin. Pl. 72. 1827. TYPE: not seen.
Hedyotis longifolia Schum. in Schum. & Thonn., Beskr, Guin. Pl. 70. 1827. TYPE: not seen.
Oldenlandia longifolia (Schum.) DC., Prodr. 4: 426. 1830.

Herbs, the stems slender, weak, glabrous to puberulent, smooth, the nodes well spaced, to 4.5 cm apart. *Leaves* sessile or subsessile, narrowly elliptic, often slightly inequilateral and curved, 1.5–5.5 cm long, 0.2–0.7 cm wide, attenuate acute at the apex and the base, the costa immersed or scarcely prominulous above, prominulous beneath, the lateral veins ca. 4, slender, strongly arcuate ascending, evanescent, membranous, smooth, minutely and sparsely puberulent above and beneath, the hairs strigose; stipules subulate and bifid, ca. 3 mm long, reflexed. *Flowers* not seen. *Fruits* subrotund, didymous, to 3 mm long, glabrous, the raphides numerous, the calycine cup short, the teeth 4, well spaced, acute, to 0.3 mm long; seeds numerous, ca. 0.2 mm long.

Oldenlandia lancifolia occurs in the tropics of the Old and the New World. Steyermark (1974) describes the flowers: "Flowers solitary at the nodes, axillary or pseudo axillary, rarely 2, pedicellate; pedicels filiform, 0.5–3.0 cm long. Lobes of the calyx lanceolate or ovate triangular, acute to acuminate, 1.0–1.5 mm long, glabrous or scabridulous on the margins. Corolla white or rarely tinted with lavender or rose, hypocrateriform; tube 1 mm long, glabrous on the front and on the back; lobes equal or larger than the tube, 1–2 mm long."

BOCAS DEL TORO: Changuinola, banana drainage ditch, *D'Arcy 11171* (MO). CANAL ZONE: Lowland E of Gatún Locks, burned about 1957, *Duke 4297* (MO). Railroad 2 km NW of Summit Gardens, 80 m, *Nee 9431* (MO).

63. PALICOUREA

Palicourea Aubl., Hist. Pl. Guiane Fr. 1: 172. 1775. TYPE: *P. guianensis* Aublet.

Palicurea Schultes in R. & S., Syst. Veg. 5: 11, 193. 1819. *Palicourea* Aubl. orth. mut.

Shrubs or small *trees*. *Leaves* mostly opposite, occasionally ternate or quaternate, petiolate; stipules interpetiolar, usually persistent, usually connate, each fused part of the sheath with 2 lobes or cusps, ascending and often varying in

length. *Inflorescences* terminal, rarely axillary, often paniculate, the flowers disposed in racemose, corymbose or thrysoid cymes. *Flowers* with the perianth and stamens usually 5-merous; hypanthium short, the teeth reduced or absent; corolla often orange, yellow or purple, the tube cylindrical, usually curved or dilated basally, the lobes short, valvate; anthers the same number as the corolla lobes; ovary 2-celled, the cells 1-ovulate, the ovules arising from the base, the septum median, thick. *Fruits* fleshy, composed of 2 pyrenes.

Palicourea, a genus of about 200 species, is common in the tropics of Middle America and South America. It also occurs in the West Indies. Standley's (1938) key to the Costa Rican species, which covers 13 of the 25 species in Panama, is noteworthy.

Literature:

Bremekamp, C. E. B. 1934. *Palicourea*. Rec. Trav. Bot. Neerl. 31: 283.

Standley, P. C. 1938. *Palicourea* (Flora Costa Rica). Field Mus. Nat. Hist., Bot. Ser. 18(4): 1330–1338.

——— & L. O. Williams. 1975. *Palicourea* in Flora Guatemala. Fieldiana Botany 24: 130–133.

1. Fruits less than 1 cm long; leaves chartaceous or membranous.
   2. Calycine lobes (at flowering) foliose or imbricate.
      3. Calycine lobes foliose ---------- 2. *P. bella*
      3′. Calycine lobes imbricate ---------- 15. *P. ochnoides*
   2′. Calycine lobes (at flowering) not foliose or imbricate.
      4. Leaves 3 per node ---------- 20. *P. triphylla*
      4′. Leaves 2 per node.
         5. Inflorescence corymbiform, usually flat topped, the branches strongly ascending ---------- 6. *P. fastigiata*
         5′. Inflorescences not corymbiform or flat topped, the branches not strongly ascending.
            6. Corolla obliquely gibbous at the base ---------- 8. *P. gibbosa*
            6′. Corolla not obliquely gibbous at the base.
               7. Calycine lobes more than 2.5 mm long.
                  8. Leaves with lateral veins 15–20.
                     9. Leaves 4–13 cm long, the lateral veins ca. 20; largest bracts with a median subulate process at the apex and 2 short lateral processes ---------- 12. *P. macrosepala*
                     9′. Leaves 18–21 cm long, the lateral veins 15–18; largest bracts acute at the apex ---------- 9. *P. grandibracteata*
                  8′. Leaves with lateral veins 11–15 ---------- 17. *P. pauciflora*
               7′. Calycine lobes less than 2.5 mm long.
                  10. Leaves with the lateral veins ca. 30; inflorescence bright yellow (fresh and dried) ---------- 24. *P. vestita*
                  10′. Leaves with lateral veins 8–21; inflorescence not bright yellow.
                     11. Leaves with lateral veins 7–10.
                        12. Flowers purple, lavender or rose ---------- 1. *P. angustifolia*
                        12′. Flowers green, yellow or white.
                           13. Leaves pubescent beneath; corolla tube 10–15 mm long ---------- 7. *P. galeottiana*
                           13′. Leaves glabrous beneath; corolla tube to 8 mm long.
                              14. Flowers white; corolla tube 3–4 mm long ---------- 4. *P. chiriquina*
                              14′. Flowers colored; corolla tube to 8 mm long ---------- 14. *P. montivaga*
                     11′. Leaves with lateral veins 11–21.

15. Corolla ca. 40 mm long, webby pubescent outside ..... 18. *P. rigidifolia*
15′. Corolla to 20 mm long, not webby pubescent outside.
16. Leaves glabrous beneath.
17. Stipular sheath rounded at the apex, scarcely retuse ..... 22. *P. tumidonodosa*
17′. Stipular sheath with 2 distinct awns or lobes.
18. Calycine lobes obtuse; corolla 10–20 mm long, pubescent outside; anthers 3–5 mm long ..... 10. *P. guianensis*
18′. Calycine lobes acute to subulate; corolla 4.5–7.0 mm long, glabrous outside; anthers less than 3 mm long.
19. Inflorescences with the upper branches spreading; leaves with the lateral veins ca. 10; corolla green or yellow ..... 14. *P. montivaga*
19′. Inflorescences with the upper branches contracted; leaves with the lateral veins 12(–14); corolla red ..... 5. *P. crocea*
16′. Leaves variously pubescent beneath.
20. Stipules with awns.
21. Leaves with lateral veins ca. 20.
22. Flowers yellow ..... 24. *P. vestita*
22′. Flowers purple, lavender or magenta ..... 16. *P. panamensis*
21′. Leaves with lateral veins 10–15.
23. Fruits turbinate ..... 23. *P. veraguensis*
23′. Fruits not turbinate.
24. Inflorescence pink; corolla glabrous outside ..... 19. *P. subrubra*
24′. Inflorescence not pink; corolla pubescent outside.
25. Leaves narrowly elongate lanceolate; corolla puberulent, purple, lavender or rose.
26. Leaves 6–11 cm wide ..... 16. *P. panamensis*
26′. Leaves to 2 cm wide ..... 1. *P. angustifolia*
25′. Leaves elliptic oblong; corolla hirtellous or villous, yellow ..... 11. *P. lasiorrachis*
20′. Stipules without awns, the lobes ovate-rotund ..... 13. *P. montensis*
1′. Fruits 1.1–1.5 cm long; leaves coriaceous or subcoriaceous ..... 3. *P. carpirostrata*
27. Leaves acute at apex, drying dark brown, the lateral veins ca. 16 ..... 3. *P. carpirostrata*
27′. Leaves rounded at apex, drying yellowish, the lateral veins 7–10 ..... 21. *P. tubuliflora*

1. **Palicourea angustifolia** H.B.K., Gen. Nov. Sp. Pl. 3: 367. 1819. TYPE: Banks of Orinoco and Rio Negro, Amazonas, Venezuela, not seen.

P. lanceolata Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 17. 1852. TYPE: Costa Rica, *Oersted 11556* (F, photo of type).
P. intermedia Oerst. ex Polak., Linnaea 41: 571. 1877. TYPE: Costa Rica, *Polakowsky 143* (F, photo of type).
P. moritzii Wernh., J. Bot. 55: 283. 1917. TYPE: Colombia, *Moritz 844*, not seen.

Shrubs or *trees* to 10 m tall, the branchlets terete, smooth, the pith often conspicuous, white, often constricted below the nodes, the latter well spaced. *Leaves* narrowly elliptic, occasionally falcate, 4–20 cm long, 1.5–4.0 cm wide, acute or obtuse at the apex, acuminate, the acumen to 2.5 cm long, often falcate, ultimately obtuse or acute, cuneate, occasionally obtuse at the base, the costa prominulous above and beneath, the lateral veins (7–)10–14, arcuate, with usually 1 evanescent parallel vein between 2 lateral veins, papyraceous or chartaceous, glabrous above, puberulent beneath especially on the costa and the veins; petioles to 2.5(–3.0) cm long, 0.08–0.10 cm wide, glabrous; stipules connate, 3.5–7.5(–9) mm long, the sheath cylindrical, 2–3 mm long, truncate, glabrous, each part with 2 subulate erect awns, mostly as long as or 2–3 times longer than the sheath. *Inflorescences* terminal, solitary, narrowly oblong, narrowly pyramidal or spiciform, thrysoid paniculate, 6–16 cm long, 2.5–5.5(–8.0) cm wide, the axes purple or red, the peduncles 2.5–7.0 cm long, to 0.2 cm wide, angular, glabrous, the lowermost branches well spaced, opposite, alternate or ternate, to 3.5 cm long; bracteoles minute, subulate, to 2 mm long. *Flowers* pedicellate; hypanthium and calycine cup short, ca. 1 mm long, the calycine lobes 5, spreading, to 0.5 mm long; corolla pale lavender, purple or rose colored, the tube cylindrical, 8–14 mm long, 0.4 mm wide, petaloid, glabrous outside, glabrous on the upper ⅔ within, the lower ⅓ pubescent, the lobes 5, oblong rotund to oblong, ca. 2.5 mm long, obtuse; stamens 5, the anthers narrowly oblong, ca. 4 mm long, the filaments subplane, 1–2 mm long, attached just above the middle of the tube, style as long as the corolla tube, the stigmas slender, ca. 0.7 mm long. *Fruits* subrotund, 4–5 mm long, purple black or dark blue, drying black, glabrous, moderately furrowed longitudinally.

Palicourea angustifolia extends from Costa Rica south to Peru. It is restricted in Panama to elevations above 2,000 ft. It is frequently confused with *P. galeottiana* Martens; the latter, however, has a yellow or orange corolla while *P. angustifolia* has a lavender to purple corolla. *Folsom & Collins 1792* has much reduced leaves, the largest blades to 8 cm long, to 2.5 cm wide.

BOCAS DEL TORO: Róbalo Trail, N slope of Cerro Horqueta, 2250–2500 m, *Allen 4929* (MO, NY). CHIRIQUÍ: Cerro Punta to Río Caldera, *Allen 1438* (MO, NY, US). Cerro Horqueta, 7000 ft, *Blum & Dwyer 2663* (MO). Las Nubes, W. of Cerro Punta, 2200 m, *Busey 667* (MO). Las Cumbres, Cerro Punta, *Croat 13717, 13764* (both MO). Monte Rey, Boquete, *Croat 15852* (MO). Las Cumbres, Cerro Punta, *Croat & Porter 16072* (MO). Bajo Chorro, Boquete, *Davidson 111* (MO, US). Cerro Horqueta, 5000–5800 ft, *Dwyer et al. 542* (GH, K, MO, UC, US). Boquete, *Dwyer 7010* (MO). Cerro Colorado, 1500 m, *Folsom & Collins 1792* (MO). Boquete, *Hagen & Hagen 2020* (NY). Cerro Horqueta, 6500 ft, *Hagen & Hagen 2051* (MO, NY). Boquete, *Hagen & Hagen 2056* (NY). Camp Aguacatal, *Pittier 3113* (US). Cerro Vaca, *Pittier 5332* (US). Upper Río Chiriquí Viejo, 1300–1900 m, *Seibert 299* (MO). Finca Collins, Boquete, *Stern et al. 1094* (MO, US), *2014, 2054* (both MO). Bambito, 1 mi SW of Cerro Punta, 5600 ft, *Tyson 5685* (MO). Cerro Punta, *White 29* (MO). Río Chiriquí Viéjo Valley, *White 36* (MO). Finca Lérida, *Woodson & Schery 215* (MO). Quebrada Velo, 1800 m, *Woodson & Schery 266* (MO). Casita Alta to Cerro Copé, 2300–3300 m, *Woodson & Schery 369* (MO). Potrero Muleto, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 460* (MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 881* (MO, NY). COCLÉ: Cerro Pilón, 3000 ft, *Duke & Lallathin 14998* (MO); *Dwyer 8338* (MO); *Kirkbride 1060* (MO); *Lallathin 441* (MO). VERAGUAS: 3.9–5 mi N of Santa Fé, 500–1000 m, *Gentry 2948* (MO). Alto Piedra, Santa Fé, *Lao 516* (MO). Cerro Tuté, 750–1000 m, *Mori 6249* (MO). N of Santa Fé, Escuela Agricola Alto de Piedra, *Mori & Kallunki 2542* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori et al. 3899* (MO). Cerro Tuté, 750–1000 m, *Mori et al. 7550* (MO).

2. **Palicourea bella** (Standley) Dwyer, comb. nov.

Psychotria bella Standley, J. Wash. Acad. Sci. 18: 185. 1928. TYPE: Panama, *Pittier 3250* (US, holotype; F, isotype).

Shrubs, the twigs 4-angled, stout, golden puberulent, the nodes well spaced except at the tips. *Leaves* elliptic, to 15 cm long, to 6.6 cm wide, deltoid at the base, the costa prominent beneath, the lateral veins ca. 22, arcuate, drying green, scarcely discolorous, white strigillose above, prominent beneath; petioles moderately slender, to 3 cm long, pilose; stipules connate to 1.5 cm long, bilobate, the lobes oblong, rotund at the apex, about ½ the length of the body or less. *Inflorescences* terminal, to 12 cm long, the cymules densely aggregated at the ends of the peduncles, the latter about 7 cm long, the primary branches ca. 2.5 mm long, ca. 5-flowered; bracts oblong, to 1.7 cm long, acute, hirtellous. *Flowers* with pedicels 4–6 mm long, pilose; hypanthium short, pilose, the calycine cup short, cupuliform, pubescent outside with short erect hairs and 5 glandular areas within, each area covered by an albuminous material and containing 6–12 oblong glands, the calycine lobes foliose, ovate to ovate elliptic, 11–14 mm long, acute, venose, petaloid, pink when dry; corolla white, cylindrical, 16 mm or longer, dilated at base, carnose, puberulent outside, villose within except at filament attachment, the lobes 5, ovate oblong, 4.5–5.0 mm long, obtuse; stamens 5, the anthers oblong, ca. 3 mm long, the filaments short, 0.5 mm wide, attached above the middle of the tube; ovarian disc compressed rotund, to 2 mm long, topped by a doughnut shaped ring, the style slender, 4–10 mm long, the stigmas slender, fingerlike, ca. 2.5 mm long. *Fruits* not seen.

Palicourea bella is known only from Panama. The corolla tube being gibbous at the base with the trichomes restricted basally suggests *Palicourea* rather than *Psychotria*. The foliose calycine lobes also point to *Palicourea*. Pittier notes that the peduncle, bracts, and calyx are pink, another feature suggesting placement in *Palicourea*. Of great interest are the slimy patches of glands within the calycine cup.

CHIRIQUÍ: Alto de Las Palmas, Cerro Horqueta, 2268 m, *Pittier 3250* (F, US).

3. **Palicourea carpirostrata** Dwyer.[72] TYPE: Panama, *Mori 5262* (MO, holotype).

Shrubs to 3 m, the twiglets stiff, drying deep red, glabrous, glandular shiny. *Leaves* lanceolate, 7.0–14.5 cm long, 2–4 cm wide, acute, acuminate, the acumen 1.0–1.5 cm long, usually falcate, ultimately obtuse, acute and scarcely inequilateral at the base, the costa plane or immersed above, prominulous distally, prominent proximally beneath, to 1.3 mm wide proximally, rubescent, the lateral veins strongly arcuate, ca. 16, rubescent, with 1–2 smaller veins between 2 lateral

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[72] *Palicourea carpirostrata* Dwyer, spec. nov. *Frutices* ramulis glabris. *Folia* lanceolata, 7.0–14.5 cm longa, 2–4 cm lata, venis lateralibus forte arcuatis coriacea in costa venisque pubescentia; petiolis ad 3 cm longis. *Inflorescentiae* ad 15 cm longae, ad 11 cm latae, pedunculo ad 6 cm longo, jugis 3 ramorum oppositorum praeditae ramis inferioribus ad 6 cm longis, bracteis inferioribus angusto-oblongis, ad 1.5 cm longis, acutis vix auriculatis basi. *Fructus* oblongi vel rotundi, 1.0–1.3 cm longi, in sicco nigri glabri calyce ad 5 mm longo.

veins, the larger one subparalleling the laterals and zigzagging toward the margin, the other veinlets pinnatiform, the margin delicately revolute, coriaceous, discolorous, drying dark brown, hirtellous on the costa and the veins beneath, the intervenal areas puberulent; petioles stiff, divergent or ascending, to 3 cm long, drying red; stipules not seen. *Inflorescences* terminal, solitary, pyramidal paniculate, to 15 cm long, to 11 cm wide, the peduncle to 6 cm long, to 0.2 cm wide, glabrous, the rachis with 3 pairs of opposite branches, arcuate or angular ascending, well separated, the lowermost to 6 cm long, the secondary branches usually with 3 branches above the middle, these alternate and umbelloid; bracts persistent, conspicuous, elongate, narrowly oblong, those at the base of the lowermost branches to 1.5 cm long, acute, concave, somewhat auriculate at the base, the margin with 2–3 minute processes, 0.1–0.2 mm long, the bracts of the upper primary and secondary branches about as long but subplane, to 3 mm long. *Flowers* not seen, but judging from the fruits in 2 unilaterally disposed cymes of 2–3 flowers. *Fruits* oblong or rotund, 1.0–1.3 cm long, black, glabrous, delicately ribbed, the calycine cup and teeth rostrate, to 5 mm long, the cup scarious, glabrous, venose, the 5 teeth slightly longer than the cup, triangular, to 3 mm long, to 0.4 mm wide, glabrous; pedicels slender, glabrous.

Palicourea carpirostrata is known only from Panama. Its specific name is based on the elongate persistent calyx of the fruit.

VERAGUAS: Cerro Tute, ridge top, cloud forest, *Mori 5262* (MO).

4. **Palicourea chiriquina** Standley, Contr. U.S. Natl. Herb. 18: 140. 1916. TYPE: Panama, *Pittier 3118* (US, holotype).

Shrubs to 3 m tall, the nodal scars circular, prominent. *Leaves* elliptic, to 7.2 cm long, to 2.2 cm wide, acute at the apex, the acumen ca. 0.5 cm long, cuneate or acute at the base, the costa subplane beneath, the lateral veins 8–9, arcuate, reaching to the margin, drying somewhat red, the margin delicately revolute, chartaceous, drying red black above, brown beneath, glabrous, minutely punctate or rugulose above; petioles slender, ca. 0.5 cm long; stipules connate, to 3 mm long, each part 2-lobed, the lobes linear, shorter than the sheath. *Inflorescences* terminal, cymose paniculate, to 6 cm long, ca. 5 cm wide, the peduncle ca. ½ the length of the inflorescence, terminated by 3 spreading branches terminated by loose clusters of radiately disposed flowers; bracteoles ca. 1 mm long. *Flowers* with the hypanthium short, the calycine cup ca. 1 mm long, the teeth evanescent, glabrous; corolla white, 5–6 mm long, the tube cylindrical, inflated, the lobes oblong, ca. 2 mm long, obtuse. *Fruits* not seen.

Palicourea chiriquina is known only from Panama.

CHIRIQUÍ: Cuesta de las Palmas, *Pittier 3118* (US). Finca Collins, Boquete, *Stern et al. 2014* (US).

5. **Palicourea crocea** (Swartz) R. & S., Syst. Veg. 5: 193. 1819.

Psychotria crocea Swartz, Prodr. Veg. Ind. Occ. 44. 1788. TYPE: Jamaica, *Swartz*, not seen.

Shrubs 1.5–3.5 m tall, the twigs smooth, glabrous, usually drying purple black, ultimately slender, the nodes well spaced. *Leaves* lanceolate or occasionally ovate lanceolate, 6.0–13.5 cm long, 3–7 cm wide, acute or acuminate at the apex, the acumen short or to 1.2 cm long, the base acute or attenuate acute, the costa slender, prominulous or plane above, scarcely prominent beneath, the lateral veins 12(–14), arcuate, prominulous above and beneath, not forming a distinct submarginal vein, evanescent at margin, membranous to chartaceous, glabrous or minutely puberulent; petioles 0.5–1.5 cm long, slender, 1.0–1.5 mm wide; stipules connate, the sheath short, 1–2 mm long, slightly swollen, truncate, each part with 2 subulate, well-spaced awns, as long as or 2–3 times longer than the sheath. *Inflorescences* terminal, reddish, contracted paniculate, 7–8(–12) cm long, 2–4(–5) cm wide, glabrous to minutely puberulent, the peduncle 2.5–3.5(–7.0) cm long, slender, 0.1 cm wide, the branches few, to 4 cm long, strongly ascending at anthesis, the lowermost 2 opposite, the upper opposite or alternate; bracts and bracteoles often persistent in fruit, subulate, to 3 mm long, spreading, the cymes few flowered. *Flowers* with pedicels capillaceous, to 1 cm long, conspicuously expanded just below the hypanthium; hypanthium oblong, ca. 1 mm long, glabrous, the calycine cup scarcely measurable, the lobes 5, ovate triangular, 0.3 mm long; corolla red, the tube (in bud) to 4.5 mm long; anthers 2.5–4.0 mm long (Steyermark), glabrous. *Fruits* rotund, oblong rotund or ovate rotund, to 3.5 mm long, glabrous, the ribs obtuse.

Palicourea crocea is found in Nicaragua, Panama, in tropical South America, and in the West Indies.

The Panamanian collections lack mature flowers and the several fruiting collections from the Republic have the fruit much shorter than typical South American material which may reach to 10 mm in length. The corolla in the only flowering material (Panama) seen is glabrous outside. *Palicourea crocea* bears a resemblance to *Fuchsia paniculata* Hemsley (Onagraceae). The latter is immediately distinguished by the numerous seeds which form minute bulges in the wall of the dried fruit.

CANAL ZONE: Summit Garden, *Croat 10789* (MO). Chiva-Chiva Trail near Miraflores Lake, *Tyson 1358* (MO). DARIÉN: Confluence of Río Chucunaque and Río Canclones, *Duke 5121* (MO). PANAMA: Tocumen, *Dwyer 4228* (MO).

6. **Palicourea fastigiata** Benth. in H.B.K., Nov. Gen. Sp. Pl. 3: 368. 1819. TYPE: Atures, Orinoco, Amazonas, Venezuela, not seen.

Shrubs to 2 m tall, the branchlets angular, glabrate. *Leaves* elliptic oblong to ovate oblong, 1.5–11.0 cm long, 3.3–5.0 cm wide, acuminate, basally acute, membranous, glabrous; petioles stout, to 0.7 cm long; stipules connate, ca. 5 mm long, each part with 2 well-spaced awns. *Inflorescences* terminal, flat topped; peduncle 5.0–10.5 cm long, glabrous, the branches erect or strongly ascending, fastigiate, the corymbs tripartite; bracts subulate, glabrous. *Flowers* on slender pedicels, ca. 1.5 cm long, fastigiate, glabrous; hypanthium and calycine cup small, glabrous, the lobes small, ovate or rounded; corolla yellow or orange pink, the tube

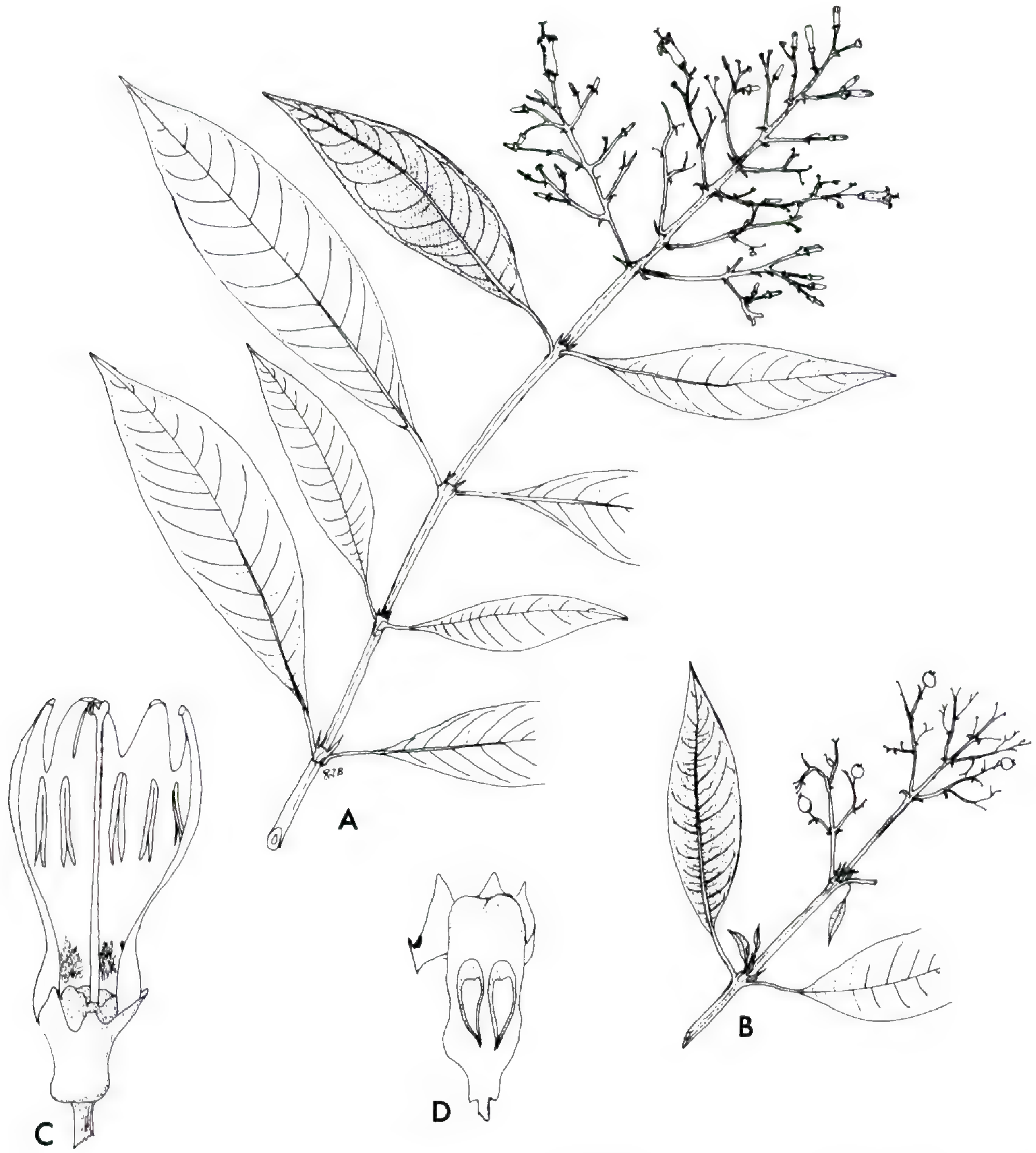

FIGURE 66. *Palicourea galeottiana* Martens.—A. Habit with inflorescence (×½).—B. Infructescence (×½).—C. Flower, part of perianth removed (×2½).—D. Ovary, longitudinal section (×5) [After *White 29*.]

cylindrical, 8–10 mm long, glabrous outside, hairy within below the middle, the lobes 5, ovate, somewhat obtuse, reflexed; stamens 5, the anthers linear, exserted, the filaments slender, attached at the mouth; style slender, about the same length as the corolla tube. *Fruits* subglobose or oblong, ca. 5 mm in diam., sulcate, glabrous, the persistent calyx umbilicate.

Palicourea fastigiata is known from Costa Rica, Panama, and northern South America. The determination of this species is uncertain; study of the original description indicates the Panamanian material cited belongs to *P. fastigiata* Benth. Steyermark (1972) in reducing *P. fastigiata* Benth. (not Cham. &

Schlecht.) to a synomym of *P. crocea* var. *riparia* (Benth.) Griseb. f. *riparia*, discusses the Venezuelan collections.

In the New York Botanical Garden an unnumbered Seemann collection from "Veraguas" was annotated by Hooker in 1849 as *P. fastigiata*. Its leaves tend to be subfalcate but in most other respects it matches those of what is here called *P. fastigiata*. The inflorescences, while fastigiate, are more patently so than in the material cited below.

CANAL ZONE: Madden Dam, *Allen 2562* (F, NY). Lion Hill Station, *Hayes 667* (F). COLOMBIA: CHOCO: Río Atrato, 2–5 hours below Río Sucio, above Loma Teguerre, *Duke 11012* (MO).

7. **Palicourea galeottiana** Martens, Bull. Acad. Bruxelles 11: 136. 1844. TYPE: Not seen.—FIG. 66.

Psychotria mexicana Willd. ex R. & S., Syst. Veg. 5: 189. 1819. TYPE: not seen.
Palicourea costaricensis Benth. Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 38. 1853. TYPE: Costa Rica, not seen.
P. mexicana Benth. ex Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 37. 1853, not *Psychotria mexicana* Willd.

Trees to 6 m tall, or *shrubs*, the twiglets smooth, glabrous, occasionally contracted below the nodes, the latter well spaced, occasionally rough with the remnants of stipules. *Leaves* lanceolate to ovate lanceolate, 6–19 cm long, 2–5 cm wide, acute or deltoid at the apex, acuminate, the acumen deltoid to attenuate triangular, to 1.5 cm long, the base acute, cuneate or obtuse, the costa prominulous above, prominent beneath, the lateral veins 10–15(–17), widely arcuate, with 1–2 subparallel, irregular, soon branching smaller veins between 2 lateral veins, the intervenal areas spreading reticulate, papyraceous, glabrate, often villose on the costa or also on the veins beneath; petioles to 2 cm long, glabrous; stipules usually persistent, connate, the sheath cylindrical, occasionally compressed cylindrical, to 4.5 mm long, truncate, each part with 2 erect or somewhat spreading awns, usually ca. 2 times the length of the sheath, to 11 mm long. *Inflorescences* terminal, paniculate, oblong or pyramidal, to 15 cm long, to 15 cm wide, the peduncle 2–6 cm long, to 0.2 cm wide, red, the branches red, of 7–8 pairs, the lowermost to 7 cm long, usually strongly ascending, occasionally strict; lowermost bracts subulate, to 0.6 cm long. *Flowers* pedicellate, the pedicels red; hypanthium ca. 0.5 mm long, glabrous, the calycine cup to 1 mm long, spreading, often with 1–2 minute glands at the sinuses, the lobes 5, oblong or compressed rotund, to 1 mm long, obtuse, usually with a few marginal cilia; corolla yellow or orange (rarely white), cylindrical, 10–15 mm long, petaloid, glabrous except ca. 3 mm above the base of the tube within, the lobes 5, oblong, 1.2–2.0 mm long; stamens 5, the anthers narrowly oblong, ca. 3 mm long, the filaments ca. 1 mm long, attached 3 mm below the mouth; style included or briefly exserted, 5–16 mm long, the shorter style with stigmas to 3.3 mm long, the ovarian disc compressed rotund, ca. 1 mm long. *Fruits* ovate oblong, to 6 mm long, conspicuously costate, glabrous, the calyx remnants minute.

Palicourea galeottiana extends from Mexico to Panama. *Mori and Kallunki* (*4789*) note that the tree was visited by hummingbirds.

CHIRIQUÍ: Bambito to Cerro Punta, *Allen 313* (MO). Paso Ancho to Monte Lirio, *Allen 1490* (MO, US). Finca Collins, Boqueté, *Blum & Dwyer 2571* (MO). Bambito and Cerro Punta, *Croat 10579* (MO). N of Audubon Cabin, *Croat 13663* (MO). NW side of Cerro Pando, *Croat 15941* (MO). El Barú above Boquete, 1200–1800 m, *D'Arcy 9898* (MO). 9 km by road WNW of Boquete, 1870 m, *Davidse & D'Arcy 10307* (MO). Volcán de Chiriquí, *Davidson 878* (MO). Cerro Horqueta, *Duke et al. 13635, 13644* (both MO). Finca Collins, Boquete, *Dwyer & Hayden 7645, 7691* (both GH, K, MO, NY, UC, US). Cerro Horqueta, *Dwyer & Lallathin 8739* (MO, NY); *Hagen & Hagen 2055* (NY). Finca Collins, Boquete, *Hayden 161* (MO). Pinola, *Kirkbride & Duke 868* (MO, NY). N of San Félix, 36.2 km from Panamerican Highway, *Mori & Kallunki 6016* (MO). Monte Lirio, upper Río Chiriquí Viejo Valley, *Seibert 301* (MO). Foothills of Volcán Barú, NW of El Hato, *Stern & Chambers 63* (MO, NY). Finca Collins, Boquete, *Stern et al. 1093* (MO). Boquete, *Stern et al. 1989* (US). Bambito, 1 mi SW of Cerro Punta, *Tyson 5690* (MO). 6 mi above Cerro Punta, Boquete trail, 7000 ft, *Tyson 7080, 7196* (both MO). Río Chiriquí Viejo Valley, Lower Cerro Punta trail, *White 54* (MO). Bajo Chorro, *Woodson & Schery 655* (MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 909* (MO, NY). VERAGUAS: 5 mi W of Santa Fé, road past Escuela Agricola Alto Piedra, *Croat 23033, 23061* (both MO). NW of Santa Fé, 1 km from Escuela Agricola Alto de Piedra, Cerro Tute, *Mori & Kallunki 4789, 4863* (both MO). 6–7 km W of Santa Fé, 2900 ft, *Nee 9824* (MO).

8. **Palicourea gibbosa** Dwyer.[73] TYPE: Panama, *Gentry & Mori 14108* (MO, holotype).

Trees to 3 m tall, the branchlets angular and black when dry, smooth, glabrous, the nodes well spaced. *Leaves* elliptic, to 20.5 cm long, to 8.5 cm wide, deltoid, rounded or obtuse at the apex, acuminate, the acumen to 1.5 cm long, often falcate, cuneate to acute at the base, the costa slender above, prominulous beneath, the lateral veins 12–17, arcuate, not forming an undulate submarginal vein, with 1–2 smaller veins between a pair of lateral veins and wrinkled on drying, thinly chartaceous, concolorous when dry, black brown, the costa and veins golden puberulent; petioles slender, flexuous, 2.5–6.0 cm long, ca. 0.2 cm wide, minutely puberulent; stipules connate, ca. 0.8 cm long, the sheath to 4 mm long, black when dry, minutely puberulent, each part not conspicuously truncate, the awns 2, triangular, to 4 mm long, to 2.5 mm wide at the base, acute, perhaps scarious toward the apex. *Inflorescences* red, cymose paniculate, pyramidal, to 17 cm long, to 10 cm wide, the peduncle 1.0–1.5(–2.5) cm long, the branches mostly opposite, well spaced or crowded on the rachis, occasionally arcuate or deflexed, slender, the lowermost to 2.5 cm long; flowers few, spreading, usually at right angles to the axis; lowermost bracts narrowly oblong, to 0.7 cm long; bracteoles tending to persist, small. *Flowers* with pedicels slender, to 10 mm long, to 0.35 mm wide, minutely puberulent; hypanthium ca. 1.5 mm long, glabrous, the calycine cup scarcely measurable, the lobes 5, oblong rotund, ca. 1 mm long, rounded at the apex, not contracted basally; corolla yellow, the tube cylindrical, ca. 10 mm long, ca. 2 mm wide in the middle, gibbous at the base, the swollen area to 5 mm wide, to 3 mm long, petaloid, glabrous outside, bearded at the upper part of the swollen area within; stamens 5, the anthers narrowly

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[73] *Palicourea gibbosa* Dwyer, spec. nov. *Arbores* ad 3 m alti, ramulis glabris. *Folia* elliptica, ad 20.5 cm longa, ad 8.5 cm lata, acumine ad 1.5 cm longo, venis lateralibus 12–17 tenui-chartacea in costa et venis aureo-puberula; petiolis 2.5–6.0 cm longis; stipulis connatis, ca. 0.8 cm longis, vagina ad 4 mm longa, utraque parte setis 2 praedita. *Inflorescentiae* cymoso-paniculatae, ad 1 cm longae, ad 10 cm latae, pedunculo 1.0–1.5(–2.5) cm longo. *Flores* in pedicellis ad 10 mm longis; hypanthio glabro lobis calycis ca. 1 mm longis, apice rotundis; corolla lutea tubo ca. 10 mm longo, extus glabro; antheris ca. 3 mm longis. *Fructus* compresso-rotundi vel subturbinati in sicco lutei glabri costis inconspicuis.

oblong, to 3 mm long, obtuse, the filaments slender, ca. 2 mm long, affixed near the middle of the tube; ovarian disc compressed rotund, bilobed, to 0.8 mm long, wider than long; style linear, to 13 mm long, drying yellow, with an S-shaped bend toward the base. *Fruits* compressed rotund to subturbinate, to 7 mm long, often as wide as long, subtruncate at the apex, drying dull yellow, glabrous, the ribs not conspicuous, obtuse, each with a delicate median longitudinal ridge. *Fruits* not seen.

Palicourea gibbosa is known only from Panama. It is marked by several diagnostic features: inflorescence red; flowers usually at right angles to the axis to which they are attached; corolla tube usually conspicuously gibbous and asymmetrical at the base.

DARIÉN: West Ridge trail from summit camp to waterfall, E of camp, Cerro Tacarcuna, 1550–1700 m, *Gentry & Mori 14108* (MO).

9. **Palicourea grandibracteata** Dwyer.[74] TYPE: Panama, *Mori & Kallunki 5262* (MO, holotype).

Shrubs to 3 m tall, the branchlets moderately slender, obtusely angular, puberulent, dark red when dry, the nodes well spaced. *Leaves* elliptic, sometimes obovate elliptic, 4–13 cm long, 1.5–4.5 cm wide, deltoid or rounded at the apex, acuminate, the acumen to 1.5 cm long, ca. 0.2 mm wide in the middle, basally acute or cuneate, often inequilateral, the costa lightly prominulous or plane above, prominulous beneath, drying dull red, the lateral veins ca. 20, arcuate, rigidly papyraceous, discolorous, green or brown when dry, villosulose on the costa and the veins beneath; petioles 2–3 cm long, often curved near the lamina, rigid, ca. 0.15 cm wide, glabrous along most of their length; stipules persistent, strongly ascending, the sheath inflated, to 5 mm long, scarious, glabrous, each part with 2 triangular lobes, to 8 mm long, to 5 mm wide. *Inflorescences* terminal, paniculate, to 15 cm long, to 11 cm wide, the peduncle 5–6 cm long, often somewhat reflexed, glabrous, the branches opposite, usually disposed as 4–6 pairs; bracts elongate, narrowly lanceolate or ovate lanceolate, the lowermost to 1.5 cm long, to 0.3 cm wide, acute, keeled, closely appressed to the stem, glabrous, venose. *Flowers* (only partially seen) pedicellate, the pedicels slender, to 1.1(–1.4) cm long, ca. 0.5 mm wide; hypanthium to 1 mm long, glabrous, the calycine cup inflated, to 1 mm long, the lobes 5, ovate, to 5 mm long, unequal in width, to 3 mm wide basally, acute, glabrous, venose. *Fruits* subrotund or turbinate, to 1.6 cm long including the persistent calyx, truncate, 10-ribbed, glabrous, black when dry.

Palicourea grandibracteata is known only from Panama. It is distinguished

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[74] *Palicourea grandibracteata* Dwyer, spec. nov. *Frutices* ad 3 m alti ramulis obtuso-angulatis puberulis. *Folia* elliptica, 4–13 cm longa, 1.5–4.5 cm lata, apice deltoidea vel rotundata, acuminata acumine ad 1.5 cm longo, basi acuta vel cuneata venis lateralibus ca. 20 rigido-papyracea; petiolis ad 2 cm longis; stipulis forte connatis vagina inflata, ad 5 mm longa, scariosa glabra parte utraque lobis 2 triangularibus, ad 8 mm longis, ad 5 mm latis. *Inflorescentiae* paniculatae, ad 15 cm longae, ad 11 cm latae, pedunculo 5–6 cm longo; bracteis elongatis angusto-lanceolatis vel ovato-lanceolatis, ad 1.5 cm longis, ad 0.3 cm latis. *Flores* calyce lobis 5 ovatis, ad 5 mm longis. *Fructus* ad 1.6 cm longi, glabri.

by its inflated stipules, each part of which has 2 triangular lobes, by its conspicuous bracts and elongate calycine teeth.

VERAGUAS: NW of Santa Fé, 2 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5262* (MO).

10. **Palicourea guianensis** Aubl., Hist. Pl. Guiane 1: 173. *tab. 66.* 1775. TYPE: French Guiana, *Aublet,* not seen.

Shrubs or trees, 4(–7) m in height, the branchlets terete, ultimately angular, smooth, glabrous, usually drying black, often constricted below the nodes, mostly 6–8 cm apart. *Leaves* oblong, often widely so, occasionally ovate oblong or elliptic, rarely oblong rotund, 9.5–32.0 cm long, 4–17 cm wide, deltoid to occasionally obtuse or acute at the apex, often acuminate, the acumen mostly 1–2 cm long, often falcate, the base cuneate, acute, obtuse or rounded, often slightly inequilateral, the costa prominulous above, prominulous to prominent beneath, to 2.2 mm wide proximally, the lateral veins (11–)15–18, widely arcuate, the intermediate veins, if present, 1–2(–3) short, soon branching, subparallel to the laterals, the intervenal areas smooth, occasionally minutely punctate beneath; petioles 1.5–3.0 cm long, glabrous; stipules connate, to 10 mm long, the sheath short, glabrous, each part 2-lobed, the lobes oblong, often closely applied to the stem, usually 3–4 times the length of the sheath. *Inflorescences* terminal, usually solitary, rarely 2–3, paniculate, glabrous or occasionally puberulent, oblong, elongate dome shaped, hemispherical or triangular in outline, 15–22 cm long, 5–9 cm wide; peduncles erect, stiff, 8–14 cm long, angular, often lignose, 0.2–0.3 cm wide, the branches numerous and stout. *Flowers* pedicellate; hypanthium ca. 1 mm long, the calyx obsolete, the cup acetabuliform, scarcely measurable, the teeth scarcely measurable; corolla yellow, the tube cylindrical, somewhat constricted below the middle, expanded basally, 1–2 cm long, stiffly petaloid, puberulent outside, occasionally the hairs granulose, glabrous within, the lobes 5, triangular, often somewhat unequal in length, to 2 mm long, acute; stamens 5, the anthers oblong, 3–5 mm long, the filaments plane, glabrous, shorter than the anthers, attached near the middle of the tube; style slender, often as long as the tube, the stigmatic area to 6.5 mm long, the stigmas oblong, to 5 mm long, the ovarian disc compressed rotund, to 0.75 mm long. *Fruits* ovoid, to 5 mm long, conspicuously costate, glabrous, drying black, the persistent calycine cup and ovarian disc ca. 1 mm long.

Palicourea guianensis extends from Guatemala south through Central America and the Guianas of northern South America. It also occurs in the West Indies.

BOCAS DEL TORO: Mile 10, railroad, *Croat & Porter 16353* (MO). Chiriquicito, *Lewis et al. 2045* (GH, K, MO, UC, US). Almirante, *McDaniel 5053* (MO). Isla Colón, *Wedel 63* (MO). Water Valley, *Wedel 897, 1524, 1612, 1840* (all MO). Chiriquí Lagoon, *Wedel 1355* (MO). Old Bank Island, *Wedel 2057, 2168* (both MO). Fish Creek Mountains, Chiriquí Lagoon, *Wedel 2355* (MO). Fish Creek lowlands, *Wedel 2384* (MO). CANAL ZONE: Mouth of Río Chagres, *Allen 896* (MO). Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16345* (MO). Gamboa and Pedro Miguel, *Bartlett & Lasser 16509* (MO). Albrook, *Blum 568* (MO). Cerro Viejo on K 16 C, *Blum 1223* (MO). 2 mi from Gatún Locks, *Blum 1489* (MO). Gaillard Highway, 1 mi NW of Summit, *Blum 2344* (MO). Pipeline Road, Gamboa, *Clewell & Tyson 3316* (MO). Albrook, *Correa 33 (MO). Road K-6 E of Arraijan, Croat 15028* (MO). Between Locks and Fort Sherman, *Croat 15362* (MO). Camp Piña, *Duke 4423* (MO).

Hill C-6, Fort Sherman, *Duke 4424* (MO). Road K-10, 1–2 mi from Kobbe, *Duke 11695* (MO). Fort Sherman, *Duke & Mussell 6635* (MO). K-6 Road, *Dwyer 2850* (MO). Albrook, *Dwyer 6748* (MO). Coco Solo, *Dwyer & Duke 7884* (GH, MO). Gamboa, Navy Pipeline Road, *Haines 545* (MO). Ancón Hill, *Killip 39950* (MO). Fort Gulick, *Lazor & Blum 5394* (MO). Gatún Lake, *Lewis et al. 1832* (GH, MO, US). Gaillard Highway at Río Masambi Grande, *Nee 7066* (MO). Albrook Air Force Base, *Stimson 5069* (MO). Fort Sherman, Road S-2, *Stimson 5099* (MO). Albrook Air Force Base, *Stimson et al. 5210* (MO). Farfan Beach, *Sullivan 569* (MO). 6 mi N of Gamboa, *Tyson 1494* (MO). Gatún Railroad Station, *Tyson 2281* (MO). BARRO COLORADO ISLAND: *Croat 4608, 4898, 5408, 5568, 5836, 5957, 6184, 6364, 6380, 12426* (all MO); *Ebinger 17* (MO); *Hayden 2, 35* (both MO); *Shattuck 954* (MO); *Starry 6, 135* (both MO); *Tyson 4208* (MO). COLÓN: Santa Rita Ridge Trail, 17–35 km from Boyd-Roosevelt Highway, 400–800 m, *Mori & Crosby 6322* (MO). DARIÉN: Cerro Pirre, *Bristan 505* (MO). El Real, *Croat & Porter 15465* (MO). Río Pirre, *Croat & Porter 15536* (MO). 2–3 mi SE of El Real, *Duke 4833* (MO). Río Piñas, *Duke 10547* (MO). Upper Río Membrillo and Camp 7, Construction Road to San Blas, *Duke 10893* (MO). Loma Cuasí, behind Manené, *Duke 13616* (MO). Río Mortí, Camp Mortí Hydro, *Duke 14119* (MO). Urutí River, *Duke & Bristan 229* (MO). Cerro Pirre, *Duke & Elias 13667, 13677* (both COL, MO, UC. VEN). Manené to mouth of Río Cuasí, *Kirkbride & Bristan 1396* (MO). 0–2 mi E of Tres Bocas, *Kirkbride & Duke 1156* (MO). N slope of Cerro Pirre, 300–700 m, *Mori & Kallunki 5376* (MO). N slope of Cerro Pirre lower montane rain forest, 700–950 m, *Mori & Kallunki 5469* (MO). LOS SANTOS: Loma Prieta, *Duke 11862* (MO); *Lewis et al. 2216* (GH, MO, US). PANAMÁ: Altos de Pacora, *Busey 805* (MO). Cerro Jefe, *Duke 9420* (MO); *Dwyer et al. 5033* (MO, SCZ, UC); *Kirkbride & Crebbs 23* (MO). SE slopes Cerro Trinidad, *Kirkbride & Duke 1671* (MO). Cerro Azul, *Tyson 2140* (MO). Chepo, *Tyson 6774* (MO). Cerro Jefe, *Tyson et al. 3331, 3430, 4368, 4400* (all MO). Arraijan, *Woodson et al. 1365* (MO). SAN BLAS: SE of Puerto Obaldía, *Croat 16735* (MO). Cuna Reservation, Río Morti, 6 mi upstream from Mortí Arriba, *Duke 8449* (MO). Mulatuppu (Río Ibedî), *Duke 8484, 8486* (both MO). E of Cangandí-Mandinga Airport, 2–5 mi S of Mandinga, *Duke 14775* (MO). Río Mulutupu, *Kirkbride 222* (MO). Opposite Ailigandí, *Lewis et al. 210* (GH, K, MO, NY, UC, US). VERAGUAS: Río de Jesús, *Dwyer 1333* (MO).

11. **Palicourea lasiorrachis** Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 39. 1852. TYPE: Costa Rica, *Oersted 11555* (F, photo, NY, photo, US, isotype).

Shrubs to 3 m tall, the branchlets terete, smooth, glabrous, ultimately pilose or villosulose, contorted, angular, the pith porate. *Leaves* elliptic oblong to ovate oblong, 6.5–16.0 cm long, 2–6 cm wide, the costa prominulous above, prominent beneath, the lateral veins ca. 16, arcuate, with 1–2 subparallel irregular veins, evanescent toward the margin, the intervenal areas spreading reticulate, stiffly chartaceous, glabrous above, villosulose on the costa and the veins beneath; petioles to 2 cm long, to 0.1 cm wide, the stipules connate, the sheath 3–5 mm long, truncate, scarious, glabrous or with a few stiffly subulate, deciduous hairs, each part with 2 subulate awns, ca. 3 mm long. *Inflorescences* terminal, solitary, thrysiform paniculate, to 14 cm long, to 7 cm wide; peduncle 4–8 cm long, ca. 0.8 cm wide, webby pubescent, the hairs of varying lengths, the branches well spaced, to 3.5 cm long; bracts and bracteoles subulate. *Flowers* pedicellate; hypanthium rotund to oblong, 0.3–0.8 mm long, glabrate to puberulent, granulose, the calycine cup scarcely measurable, eglandular within but with occasional subulate glands at the sinuses, the lobes 5, triangular or rotund, 0.5–0.7 mm long, densely villosulose to glabrate; corolla green to yellow, the tube slender, 7–10 mm long, glabrous outside except occasionally granulose and pubescent toward the apex, densely villose within 2–3 mm above base; anthers 5, narrowly oblong, subsessile; style slender, to 4.5 mm long, the stigmas digitiform, ca. 2 mm long. *Fruits* not seen.

Palicourea lasiorrachis is known only from Costa Rica and Panama. The

flowers are small for a *Palicourea* and the indumentum of the calyx and the corolla is quite variable. *Kirkbride & Duke* (*994*) note that the corolla is purple with the inflorescence green to yellow. Antonio Molina has annotated a sheet, *Williams et al. 28241* (F), from El Canon, S of Cartago, Talamanca Range, Costa Rica, 2,500 m as *P. lasiorrachis*. The fruit is turbinate, ca. 5 mm long, conspicuously ribbed, on pedicels shorter than the fruit.

CHIRIQUÍ: Bajo Chorro, Boquete, 6000 ft, *Davidson 171* (MO). Chiriquí Trail, Elfin Forest at Divide, *Kirkbride & Duke 994* (MO).

12. **Palicourea macrosepala** Krause, Bot. Jahrb. Syst. 54: Beibl. 119: 41. 1916. TYPE: Costa Rica, *Tonduz 7704* (Photo, F).

Trees to 5.6 m tall, the bark of the twiglets somewhat smooth, minutely pustulate, glabrescent. *Leaves* strongly ascending, oblong elliptic, 18–21 cm long, 7.5–8.0 cm wide, deltoid or acute at the apex, attenuate acute at the base, the costa plane or sulcate above, prominent beneath, angular, drying red, to 1.5 mm wide, the lateral veins 15–18, arcuate, drying red beneath, the intervenal areas spreading reticulate, the blade glabrous above, pubescent beneath, especially on the veins, the costa sparsely ciliate, the intervenal areas minutely pubescent; petioles to 3.5(–4.5) cm long, glabrescent, cracking, sometimes twisted, the blade slightly decurrent; stipules connate, intrapetiolar, the sheath appressed to the stem, cylindrical, ca. 0.7 cm long, stiffly petaloid, each part with 2 triangular, coriaceous lobes shorter than the sheath, the hairs few. *Inflorescences* terminal, solitary, cymose paniculate, to 23 cm long, plane, the lowermost branches opposite, strongly ascending, to 9 cm long; bracts linear subulate, to 1 cm long, the longer ones with a median subulate process and 2 short processes. *Flowers* with the hypanthium compressed cylindrical, ca. 1 mm long, glabrous, the calycine cup ca. 0.8 mm long, the lobes 5, oblong, 1.5–2.0 mm long, scarcely puberulent; corolla pale purple, the tube cylindrical, uniformly wide, ca. 5 mm long, thinly carnose, glabrous within, the lobes 5, 1–3 mm long, thick, glabrous, cucullate; stamens 4–5, the anthers narrowly oblong, ca. 3 mm long, obtuse, sagittate basally, the filaments ca. 0.3 mm long, attached near the mouth or at the base of the tube; ovarian disc compressed ovate rotund, ca. 0.5 mm long, the style slender, 3.2–4.5 mm long, the stigmas ca. 0.5 mm long. *Fruits* (immature) narrowly oblong, ca. 5 mm long, ca. 1.5 mm wide, obtuse, conspicuously reflexed, the calycine lobes persistent, much wider than at anthesis.

Palicourea macrosepala is known from Costa Rica and Panama. In the type the calyx lobes are longer than in the Panamanian collection, being 2.5–3.0 mm long. The inflorescence appears different in having few pairs of widely spread branches rather than strongly ascending numerous branches. The Costa Rican *P. brenesii* Standley has markedly elongate calycine lobes in the flowering stage. The leaf blades of this species, however, tend to be obtuse or rounded at the apex and the lateral veins (ca. 24) are more numerous than in *P. macrosepala*.

CHIRIQUÍ: 5.4 km from Hato de Volcán on the road to Los Lagunas, *Correa & Lazor 1478* (MO).

13. **Palicourea montensis** Dwyer.[75] TYPE: Panama, *Mori & Kallunki 5880* (MO, holotype).

Trees to 5 m tall, the branchlets terete, ultimately angular or plane, often twisted, smooth, black when dry, golden puberulent, the nodes well spaced. *Leaves* often moderately ascending, ovate oblong or oblong, 4.5–10.0 cm long, 2.5–5.0 cm wide, deltoid or widely deltoid toward the apex, acuminate, the acumen to 1 cm long, obtuse to truncate at the base, sometimes inequilateral, the costa subplane above, prominulous beneath, the lateral veins 10–11, arcuate, the submarginal vein close to the margin, puberulent on both sides, especially on the costa and the veins, rigidly papyraceous, discolorous; petioles rigid, to 2 cm long, ca. 0.15 cm wide; stipules small, connate, compressed rotund, to 0.4 mm long, each part of the sheath with 2 ovate rotund lobes ½–¾ the length of the sheath, obtuse, puberulent. *Inflorescences* terminal or pseudo terminal, pyramidal paniculate, to 16 cm long, to 23 cm wide, the peduncle to 7 cm long, to 0.35 cm wide, puberulent, the lowermost branches 2, opposite, to 7 cm long, often arcuate, the upper branches disposed as 4–5 well spaced pairs, mostly 1–4 cm apart; bracts subulate, 3.5 mm long. *Flowers* sessile or subsessile; hypanthium short, the calycine cup small, patulous, to 0.2 mm long, the lobes 5, subrotund, to 0.3 mm long, obtuse; corolla white, the tube cylindrical, to 4 mm long, to 2.3 mm wide, petaloid, glabrous outside, within densely villose near the middle, the lobes 5, oblong, to 2 mm long, obtuse; stamens 5, the anthers narrowly oblong, ca. 1.5 mm long, obtuse, deeply sagittate below, the filaments linear, ca. 2 mm long, attached below the middle of the tube; ovarian disc oblong rotund, to 0.6 mm long; style ca. 2 mm long, the stigmas ca. 1.3 mm long, thick. *Fruits* not seen.

Palicourea montensis is known only from Panama. It is closely related to *P. tumidonodosa* Dwyer, known only from one collection in Darien Province, which has a somewhat immature inflorescence. It differs in having a much more patulous inflorescence, in having smaller and less turgid stipules with each part of the sheath bilobed, in its thin chartaceous leaves with fewer lateral veins, and in being puberulent. The nodes of *P. tumidonodosa*, unlike those of *P. montensis*, are conspicuously swollen and turgid. The bracts of *P. montensis*, subtending the lowermost branches of the inflorescence, seem shorter. The fact that the flowers are white is noteworthy.

CHIRIQUÍ: N of San Félix, on Bocas del Toro border, 5000–5500 ft, *Mori & Kallunki 5880* (MO).

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[75] *Palicourea montensis* Dwyer, spec. nov. *Arbores* ad 5 m altae ramulis aureo-puberulis. *Folia* ovato-oblonga vel oblonga, 4.5–10.0 cm longa, 2.5–5.0 cm lata, acumine ad 1 cm longo, subobtusa basi vel truncata venis lateralibus 10–11, rigido-papyracea discoloria minuto-puberula utrinque; petiolis ad 2 cm longis; stipulis connatis vagina ad 0.4 mm longa, lobis 2 ovato-rotundis, 0.2–0.3 mm longis, obtusis puberulis. *Inflorescentiae* terminales vel pseudoterminales, ad 16 cm longae, ad 23 cm latae, pedunculo ad 7 cm longo, jugis ramorum inferiorium ad 7 cm longis. *Flores* hypanthio brevissimo cupula calycis ad 0.2 mm longa, lobis subrotundis, ad 0.3 mm longis; corolla alba tubo ad 4 mm longo extus glabro intus proxime medium denso-villoso, lobis ad 2 mm longis; antheris ad 1.5 mm longis; stylo ca. 2 mm longo; disco ovarii ca. 0.6 mm longo.

14. **Palicourea montivaga** Standley, J. Wash. Acad. Sci. 18: 279. 1928. TYPE: Costa Rica, *Standley & Valerio 49850* (US, holotype; F, isotype).

P. salicifolia Standley, J. Wash. Acad. Sci. 18: 280. 1928. TYPE: Costa Rica, *Tonduz 11828* (F, holotype).

Shrubs or *subshrubs* to 2.5 m tall (fide Standley), the branchlets smooth, glabrous, the pith porate, the nodes crowded or not, occasionally swollen. *Leaves* elliptic or obovate elliptic, 4–10 cm long, 1.0–3.2(–4.0) cm wide, deltoid or obtuse at the apex, often abruptly acuminate, the acumen to 0.7 cm long, acute, usually vaguely falcate, basally cuneate to acute, the costa prominulous above and beneath, the lateral veins 10–13, scarcely prominulous above, prominulous beneath, with 1–4 subparallel intermediate veins between a pair of lateral veins, these soon evanescent, the intervenal areas patulous reticulate, stiffly chartaceous, membranous ?, glabrous; petioles to 1.5 cm long, 0.1–0.15 cm wide; stipules connate, the sheath ca. 2 mm long, each with 2 awns about the same length as the body or longer, to 2.5 mm long, scarious, glabrous. *Inflorescences* (in fruit) cymose paniculate, oblong, to 9 cm long, to 5 cm wide, rounded at the apex; peduncles to 3 cm long, the lowermost branches paired, strongly ascending, to 4 cm long, the upper branches several, well spaced, spreading, paired or ternate, glabrous or puberulent. *Flowers* sessile or on pedicels to 2.5 mm long; hypanthium ca. 1 mm long, the calycine cup ca. 0.6 mm long, the teeth triangular, ca. 0.3 mm long, obtuse or acute; corolla green or yellow, the tube ca. 7 mm long, ca. 2.5 mm wide, the lobes triangular, obtuse, ca. 1.5 mm long. *Fruits* obovate to obovate rotund, ca. 4.5 mm long, glabrous, each pyrene 5-costate, often one seed aborted and then the fruit subfalcate.

Palicourea montivaga is known from Costa Rica and Panama. The leaves of the type collection are much narrower and have a more salicoid appearance than the single Panama collection.

CHIRIQUÍ: Bajo Chorro, *Davidson 255* (MO, US).

15. **Palicourea ochnoides** Dwyer.[76] TYPE: Panama, *Witherspoon et al. 8872* (MO, holotype).

Trees to 3 m tall, the branchlets slender, glabrous, drying red, glabrous, the nodes well spaced, swollen. *Leaves* lanceolate, 8–14 cm long, 2.5–4.0 cm wide, acute, caudate acuminate, the acumen to 1.5 cm long, the costa slender, plane or immersed above, prominulous beneath, to 1.5 mm wide proximally beneath, the lateral veins ca. 22, arcuate, plane above, prominulous and drying red be-

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[76] *Palicourea ochnoides* Dwyer, spec. nov. *Arbores* ramulis gracilibus, glabris. *Folia* lanceolata, ad 14 cm longa, ad 4 cm lata, venis lateralibus ca. 22, rigido-chartacea supra glabra subtus puberula; petiolis ad 2.5 cm longis; stipulis connatis vagina turgida scariosa glabra in sicco rubra parte utraque lobis triangularibus duobus, ad 4 mm latis basi. *Inflorescentiae* terminales cymoso-paniculatae, pyramidales, ad 12 cm longae, ramis oppositis jugis 3–4, bracteis inferioribus ad 1.8 cm longis concavis brevi-auriculatis basi; bracteola utraque florem unum occulante foliosa oblonga, ad 11 mm longa, ad 5 mm lata, subplana, glabra. *Flores* pedicellati; hypanthio glabro cupula calycis brevissima lobis 5 foliosis imbricatis ovato-oblongis, ad 5 mm longis, ad 2.5 mm latis subconcavis glabris in sicco luteo; corolla alba tubo intus villoso.

neath, not forming a distinct undulate, submarginal vein, with 1–2 smaller veins subparallel to and located between adjacent lateral veins, these evanescent toward the middle of the blade, the smaller veins pinnatiform, the margin scarcely thickened, stiffly chartaceous, concolorous, glabrous and smooth above, puberulent beneath; petioles 0.5–2.5 cm long, ca. 1 mm wide, stiff, glabrous; stipules persistent toward the tips of the twiglets, connate, the sheath turgid, cylindrical, scarious, drying red, each part with 2 triangular lobes, about as long as the sheath, to 4 mm wide at the base, ciliolate. *Inflorescences* terminal, solitary, cymose pyramidal paniculate, to 12 cm long, to 6.5 cm wide, the peduncle to 6.5 cm long, to 0.18 cm wide, smooth, glabrous, the branches opposite, disposed as 3–4 well-spaced pairs, the lowermost to 3 cm long, the lowermost bracts oblong, to 1.8 cm long, concave and often investing much of the branch, acuminate, scarious, drying red, glabrous, shiny, venose, with an auricle on each side at the base, the lobe to 1 mm long, obtuse, ciliolate, each flower apparently partially hidden by a bracteole, the latter oblong, to 11 mm long, to 5 mm wide, foliose, acuminate, venose, glabrous, the same general texture as a calycine lobe. *Flowers* pedicellate, the pedicels to 1.5 mm long, glabrous, the hypanthium 0.7–1.0 mm long, drying red, glabrous; calycine cup short, expanded, the lobes 5, imbricate, foliose, ovate oblong, to 6 mm long, to 2.5 mm wide, obtuse, concave, glabrous inside and out, venose, drying yellow; corolla white, carnose, glabrous outside, villose within, the lobes slightly cucullate; anthers 5, oblong, to 1 mm long. *Fruits* not seen.

Palicourea ochnoides is known only from Panama. It is so called because the inflorescence and the flower buds have the appearance of an *Ouratea* of the Ochnaceae. The new species has several diagnostic characters: the lowermost bracts as long as the branches of the inflorescence and auriculate at the base; bracts subtending the individual flowers being foliaceous; calycine lobes being imbricate and reaching a length of 6 mm. Unfortunately only immature corollas, stamens, etc. were seen. While the collectors described the flowers as white, it is likely that they were describing the bracteoles and/or the calycine lobes rather than the corolla.

VERAGUAS: Trail E side of Cerro Tute, ca. 1200 m, *Witherspoon et al. 8872* (MO).

16. **Palicourea panamensis** Standley, Ann. Missouri Bot. Gard. 25: 839. 1938. TYPE: Panama, *White & White 14* (MO, holotype; F, isotype).

Shrubs to 3 m tall, the twigs terete, glabrous or pubescent, usually golden villose above, the twiglets hollow, 4-angled, bright purple, the hairs deciduous. *Leaves* elliptic oblong or ovate oblong, 10–23 cm long, 6–11 cm wide, rounded or obtuse at the apex, abruptly acuminate, the acumen widely triangular, 1.0–1.5 cm long, acute, widely cuneate and often slightly inequilateral at the base, the costa prominulous above, subplane to prominent beneath, the lateral veins 12–21, widely arcuate, the intermediate veins several, branched and evanescent, often short, the tertiary veins parallel and somewhat perpendicular, papyraceous or chartaceous, discolorous, glabrate above, puberulent on costa and veins beneath; petioles 1.5–4.5 cm long, 0.15–0.25 cm wide, stiff or flexuous, glabrate; stipules persistent, connate, the sheath 0.8–1.5 cm long, turgid, cylindrical, trun-

cate, each part with 2 lanceolate, subulate or ovate subulate equal lobes, coriaceous, puberulent. *Inflorescences* terminal, solitary, thrysoid paniculate, ovate oblong to pyramidal, to 26 cm long, to 14 cm wide, the peduncles rigid, 3–7 cm long, 0.2–0.4 cm wide, angular, puberulent. *Flowers* with the hypanthium oblong, ca. 1 mm long, puberulent, the calycine cup ca. 0.3 mm long, the lobes 5, unequal, 1.2 mm long, acute, puberulent or ferrugineous villose, the margin ciliolate, reflexed after fall of corolla tube; corolla purple, lavender, magenta, or yellow?, the tube to 15 mm long, glabrate or pubescent. *Fruits* (immature) subrotund or turbinate, to 3 mm long, truncate, the persistent calyx to 2 mm long, the lobes ciliolate, triangular, longer than the calycine cup, 10-ribbed, glabrous, drying black.

I have reservations about placing the new species in *Palicourea* rather than in *Psychotria*. The fact that the corolla tube is gibbous at the base, the anthers blue, the calyx lobes lavender (fide *Dwyer 5034*) and the cymules lavender green seem to favor *Palicourea*. The corolla, on the other hand, is white which is more suggestive of *Psychotria*. The stipules are so reduced in size as to be difficult to discern and often appear to be torn by the exaggerated nodal scars.

PANAMÁ: Cerro Jefe, *Dwyer et al. 5034* (MO); *Mori & Kallunki 6082, 6493, 6505*; *Mori 7127* (all MO).

Palicourea panamensis is known only from Panama. Collections from Chiriqui have flowers ranging in color from purple, lavender, to magenta. *Duke 6575* from Darien notes that the flowers are yellow and the pedicels red.

BOCAS DEL TORO: Divide on Chiriquicito-Caldera Trail, Elfin Forest, *Kirkbride & Duke 994* (MO). CHIRIQUÍ: Slopes of Volcán de Chiriquí Viejo, along Río Chiriquí Viejo, 1200 m, *Allen 986* (MO). NW side of Cerro Pando, *Croat 15939* (MO). Foothills of Volcán Barú, NW of El Hato, 4500 ft, *Stern & Chambers 61* (MO). Las Lagunas, 2 m SW of El Volcán, *Tyson 870* (MO). Valley of upper Río Chiriquí Viejo, 1300–1900 m, *White & White 14* (MO). DARIÉN: Cerro Pirre, 3700 ft, *Duke 6575* (MO). Cerro Pirre, 2500–4500 ft, *Duke & Elias E 13729* (MO). Cuasí-Caná trail between Cerro Campamiento and La Esclarera, E of Tres Bocas, *Kirkbride & Duke 1331* (MO). VERAGUAS: Santa Fé, 2 km from Escuela Agricola, Alto de Piedra, *Mori & Kallunki 5262* (MO).

17. **Palicourea pauciflora** Standley, J. Wash. Acad. Sci. 18: 278. 1928. TYPE: Panama, *Pittier 3237* (US, holotype).

Shrubs, the twigs branching freely, terete, ultimately angular, the nodes well spaced. *Leaves* elliptic to obovate elliptic, to 7.5 cm long, to 2.5 cm wide, narrowly acuminate, the acumen to 1.5 cm long, ultimately acute, cuneate at the base, the lateral veins ca. 11, arcuate, stiffly chartaceous, concolorous; petioles ca. 1 cm long; stipules persistent, connate, turgid, ca. 0.5 cm long, each part with 2 triangular lobes, acute to obtuse. *Inflorescences* terminal, to 5 cm long, to 5 cm wide; peduncle to 3 cm long, the branches few, slender, opposite, few flowered, the bracts narrowly oblong, to 1 cm long; bracteoles narrowly oblong. *Flowers* with pedicels to 1 cm long; hypanthium short, the calycine cup and lobes to 0.8 cm long, the lobes longer than the cup, glabrous, 5.0–6.5 mm long; corolla greenish purple, large, 1.0–1.5 cm long, the tube about twice the length of the lobes. *Fruits* not seen.

Palicourea pauciflora is known only from the type collection.

CHIRIQUÍ: Cerro Horqueta, 2100–2268 m, *Pittier 3237* (F, US).

18. **Palicourea rigidifolia** (Dwyer & Hayden) Dwyer, comb. nov.

Cephaelis rigidifolia Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 37. 1968. TYPE: *Dwyer 8075 A* (MO, holotype).

Shrubs or small *trees* to 5 m tall, the branchlets terete, the internodes drying contracted and angular. *Leaves* oblong, 10–21 cm long, 3.5–8.0 cm wide, acute at the apex, ultimately acuminate, the acumen to 1.3 cm long, cuneate or slightly obtuse at the base, the costa prominulous above, prominent beneath, convex, the lateral veins 12–15, arcuate, prominent, stiffly subcoriaceous to rigidly chartaceous, slightly discolorous, brown when dry, appressed white ciliate above, golden pilose beneath with some hairs hook shaped and rigid; petioles 1.0–2.5 cm long, lignose, pilose; stipules connate, the sheath urceolate or briefly cylindrical, rigid, turgid, to 0.7 cm long, golden puberulent, each part with 2 subulate awns, to 0.4 cm long, rigid, well spaced and erect. *Inflorescences* terminal, to 9 cm long, the peduncle absent or 1–4 cm long, the flowers often crowded above the middle of the rachis, the latter densely villosulose, to 0.3 cm wide; the lowermost bracts subulate, to 4 mm long, the flowers large, arranged in a loose subrotund head, to 8 cm wide, sometimes resembling a fan. *Flowers* with the hypanthium subrotund, to 1 mm long, white villose, the teeth 5–6, ca. 0.8 mm long; corolla violet or purple, the tube conspicuously elongate, to 4 cm long, to 0.6 cm wide toward the apex, narrower below the middle, to 1.5 mm wide, petaloid outside with patches of webby, flat, triangularly subulate hairs to 1.5 mm long, the cells of which are bubblelike, glabrous within, the lobes 5, short, oblong, to 3 mm long, thicker than the tube, moderately hooded; stamens 5, the anthers oblong, 3.0–3.5 mm long, the style elongate, 30–40 mm long, ca. 0.35 mm wide, plane compressed, the stigmas 2, fingerlike, 2.0–3.3 mm long. *Fruits* sessile, immature, didymous, dirty yellow, drying red, subrotund, to 8 mm in diam., minutely golden puberulent.

Palicourea rigidifolia is known only from Panama. It is distinguished by its stiff and usually subcoriaceous leaves and its corolla having a cobwebby mass of hairs outside.

PANAMÁ: Cerro Jefe, *Busey 787* (MO); *Dwyer 8075 A* (MO); *Folsom et al. 2010* (MO); *Gentry 762* (MO); *Tyson et al. 4339* (MO).

19. **Palicourea subrubra** Polak., Linnaea 4: 571. 1877. TYPE: Costa Rica, *Polakowsky 200A* (Photo, F).

Small *trees* to 3 m tall, the branchlets slender, ultimately 4-angled, glabrous, the nodes well spaced. *Leaves* ascending, narrowly lanceolate, 10–15 cm long, 2.5–3.6 cm wide, attenuate toward the apex, often contracted, acuminate, the acumen to 2.5 cm long, cuneate at the base, the costa plane or immersed above, scarcely prominent beneath, the lateral veins 12–14(–20), arcuate, slender, prominulous, the submarginal vein absent, rigidly membranous, glabrate above, puberulent beneath, somewhat hirsute on the costa, the hairs stiff, parallel to the blade; petioles slender, 2.5–2.8 cm long, to 0.1 cm wide; stipules connate, persistent, the sheath somewhat turgid, to 0.3 cm long, to 0.3 cm wide, each part with 2 awns, the latter to 0.25 cm long, erect, glabrous. *Inflorescences* terminal,

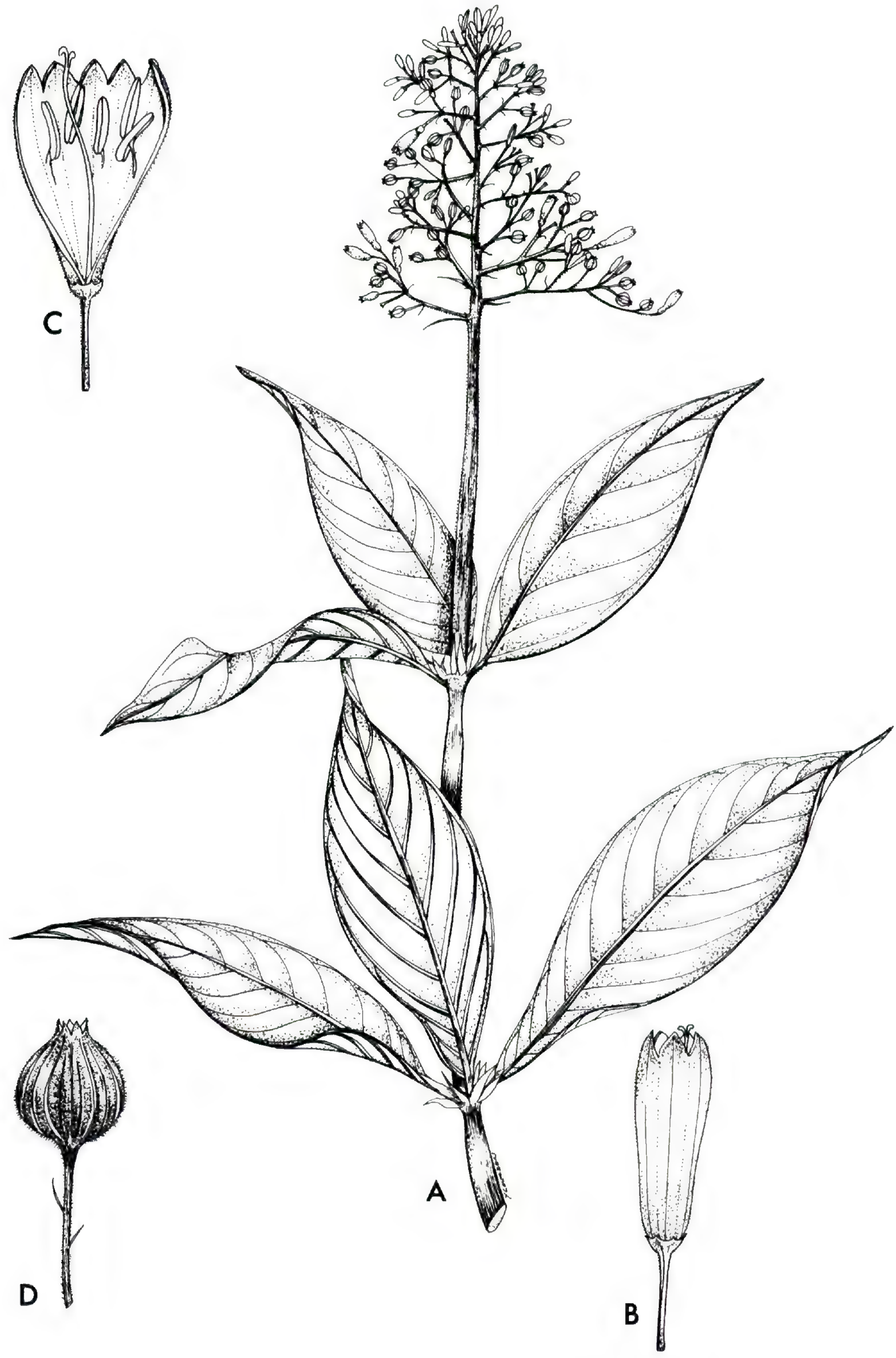

FIGURE 67. *Palicourea triphylla* (Muell.-Arg.) DC.—A. Habit (×½).—B. Flower (×2½).—C. Flower, opened to show interior (×2½).—D. Fruit (×3½). [After *Nee 8178*.]

paniculate, to 11 cm long, to 9 cm wide, pink; peduncle to 3 cm long, glabrous, the branches disposed as 7–10 pairs, opposite or subopposite, spreading or ascending, the lowermost to 6 cm long; bracts often persistent, subulate, to 0.5 cm long. *Flowers* with pedicels 0.3–0.5 cm long, slender, with each bracteole minute, oblong or subulate, to 1.5 mm long, erosulose at the apex; hypanthium ca. 1 mm long, the calycine teeth 5, triangular, ca. 0.35 mm long; corolla yellow, red, purple, violet, the tube narrowly cylindrical, 10–15 mm long, glabrous outside, villose within, only 1–2 mm wide at the base, the lobes 5, triangular, ca. 1 mm long; stamens 5, the anthers narrowly oblong, to 3.2 mm long, obtuse, the filaments ca. 2 mm long, attached ca. 3 mm below the mouth; ovarian disc subrotund, to 0.7 mm long, the style slender, to 4.5 mm long, the stigmas 2, linear oblong, ca. 2 mm long. *Fruits* with pedicels shorter or longer than the fruit proper, oblong rotund or oblong, to 0.8 cm long, ribbed, the persistent calyx to ⅓ the length of the body, glabrous.

Palicourea subrubra is known from Costa Rica and Panama. It is a high mountain species distinguished from the other Panamanian species by its reduced stipules and pinkish inflorescence. The variability of corolla colors is noteworthy.

CHIRIQUÍ: Bajo Chorro, *Davidson 111* (F). Cerro Horqueta, 6500 ft, *Hagen & Hagen 2069* (F). DARIÉN: Cerro Tacarcuna, S slope, ridge top forest, well below summit, premontane wet forest, 1250–1450 m, *Gentry & Mori 13913* (MO).

20. **Palicourea triphylla** (Muell.-Arg.) DC., Prodr. 4: 526. 1830.—FIG. 67.

Psychotria triphylla Muell.-Arg. in Mart., Fl. Bras. 6(6): 233. 1881. TYPE: British Guiana, *Patris*, not seen.

Shrubs or *trees* to 7 m tall, the branchlets terete, smooth, glabrous, usually constricted below the nodes. *Leaves* 2 or 3 at a node, lanceolate, often falcate, often 4 times longer than wide, to 26 cm long, to 8 cm wide, acute, usually cuspidate, the cusp to 1.5 cm long, acute or cuneate at the base, usually slightly inequilateral, the costa prominulous above, prominent beneath, the lateral veins 12–16, arcuate, prominulous or immersed above, prominulous beneath, the intervenal areas spreading reticulate, papyraceous, usually concolorous, puberulent above especially on the costa, often farinose above from persistent hair bases, villosulose beneath especially on the veins, often farinose in the intervenal areas; petioles almost absent or to 1.5 cm long, often curved; stipules connate, the sheath short, to 2 mm long, the awns 2, erect, subulate, to 12 mm long, stiff, marginally puberulent. *Inflorescences* terminal, solitary, exceeding the uppermost leaves, to 30 cm long, the peduncle rarely absent, to 15 cm long, often as long as the floriferous portion, stout, puberulent, thrysoid paniculate, the branches numerous, stiffly ascending, the flowers numerous. *Flowers* with the hypanthium subrotund to cuneate, ca. 1 mm long, puberulent, the calycine cup ca. 1 mm long, glabrous within, the teeth reduced to 5 irregular erosulose points; corolla orange or yellow, the tube narrowly cylindrical, subturgid at the base, ca. 12.5 mm long, densely puberulent outside, villose within at the mouth and with a few hairs at the base of the tube, the lobes 5, short, ca. 1.5 mm long, obtuse, not cucullate; stamens 5, the anthers narrowly oblong, ca. 3 mm long, obtuse, dorsifixed, the filaments short, ca. 1.5 mm long, attached near upper ⅔ of the

tube; style linear, the ovary thick walled. *Fruits* pedicellate, subrotund, ovate rotund, ca. 4 mm in diam., the calycine cup coroniform, each pyrene markedly 4-costate, puberulent, the raphides numerous.

This species is widely distributed throughout tropical America. The fact that the species has ternate leaves permits ready recognition.

BOCAS DEL TORO: Macaw Hills, S of Bocas, *Wedel 521* (MO). Chiriquí Lagoon, *Wedel 1143* (MO). Water Valley, *Wedel 1904* (MO). CANAL ZONE: Ancón Hill, *Bartlett & Lasser 16313* (MO). Ancón, *Gervais 132* (US). Corozal, *Standley 27374* (US). Río Tapia, *Standley 28172, 28205* (both US). Albrook Air Force Base, *Tyson 2033* (MO). CHIRIQUÍ: San Félix to Cerro Flor, *Allen 1939* (MO). San Félix, *Pittier 5254* (US). COCLÉ: El Valle, *Allen 1892* (MO, NY), *2477* (MO), *3603* (NY). Penonomé, *Dwyer 2018* (NY). La Pintada, *Hunter & Allen 523* (MO). El Valle, *Woodson et al. 1303* (MO, NY). DARIÉN: Gold mine at Caná, 500–600 m, *Croat 37644* (MO). Caná, *Goldman 1906* (US). La Palma, *Pittier 6698* (US). Caná, *Stern et al. 506* (MO). Periaque Camp, *Tyson et al. 4766* (MO). HERRERA: Las Minas and Pesé, *Duke 12334* (MO). Ocú, *Lewis et al. 1648* (MO). La Peña, *Stern et al. 1762* (MO). PANAMÁ: Río Tocumen, *Bartlett & Lasser 16478* (MO). Panamá and Chepo, *Dodge et al. 16641* (MO). Cerro Azul, *Dwyer 4001* (MO). Cerro Campana, *Dwyer et al. 4715* (MO). Pacora and Chepo, *Dwyer et al. 5122* (MO). Cerro Azul, *Dwyer & Hayden 8026* (MO). Goofy Lake, *Gentry 6122* (MO, NY). Río Tocumen, *Hunter & Allen 245* (MO). Sabanas, *Bro. Paul 607* (US). Taboga Island, *Pittier 3597* (US). Río Tocumen, *Standley 26641* (US). Miraflores Lake, *White 249* (MO). Isla Taboga, *Woodson et al. 1473* (MO, NY). VERAGUAS: San José, Santiago-Santa Fé Road, *Nee 8178* (MO).

21. **Palicourea tubuliflora** Dwyer[77] TYPE: Panama, *Mori & Kallunki 6082* (MO).

Trees 5–8 m tall, the trunk 10 cm or more dbh, the twiglets much branched, angular, glabrous, smooth, the internodes 1.5–5 cm apart, the nodes knotty, turgid, the petiole scars conspicuous. *Leaves* oblong rotund or oblong, 6–9 cm long, 3.2–6 cm wide, regularly less than twice as long as wide, rounded or obtuse at the apex, rarely deltoid, the acumen absent or to 3 mm long, rounded or widely cuneate at base, the costa slender, prominulous beneath, the submarginal undulate vein 1–3 mm from margin, the interval areas indistinct above, reticulate beneath, the margin plane or scarcely revolute, thickly coriaceous, drying dull yellow green, glabrous, lustrous; petioles 1.5–2.5 cm long, rigid, glabrous; stipules connate, the sheath less than 1 mm long, truncate, coriaceous, glabrous, the awns scarcely measurable, widely spaced. *Inflorescences* terminal, exceeding the uppermost leaves, cymose paniculate, 8–12.5 cm long, 3–7 cm wide, the peduncle 4–7 cm long, to 0.27 cm wide, angular, drying black, glabrous, the lowermost branches opposite, rigid, angular-ascending, the upper branches few, usually alternate, the bracteoles minute, triangular subulate, to 2 mm long, the cymes few flowered, often delicately lavender-green. *Flowers* sessile, the hypanthium ca. 1 mm long, drying black, glabrous, the calyx cup scarcely measurable, the

[77] *Palicourea tubuliflora* Dwyer spec. nov. *Arbores* 5–8 m altae, ramulis angulatis glabris nodis crassis. *Folia* oblongo-rotunda vel oblonga, 6–9 cm longa, 3.2–6 cm lata, apice rotundata vel obtusa venis lateralibus 7–10, valde coriacea glabra; petiolis 1.5–2.5 cm longis, glabris; stipulis connatis vix 2 mm longis truncatis glabris. *Inflorescentiae* terminales cymoso-paniculatae, 8–12.5 cm longae 3–7 cm latae, pedunculo 4–7 cm longo ramis floribusque paucis. *Floribus* lobis calycis rotundis ad ovato-rotundis ad 1 mm longis; corolla alba tubiforme extus glabra untus barbata lobis ad 4 mm longis; antheris lineari-oblongis, ad 2 mm longis, versatilibus. *Fructus* oblongi, ad 1 cm longi, vix costati, glabri.

lobes often lavender, compressed-rotund to ovate-rotund, less than 1 mm long, obtuse, the corolla occasionally falcate in bud, the tube white, yellow at the mouth, tubular, to 6.5 mm long, gibbous at base, constricted in middle, glabrous outside, bearded above the middle within, the lobes 5, oblong, to 4 mm long, often bearded at base; anthers linear-oblong, to 2 mm long, versatile, the filaments longer than the tube, attached near the mouth; style filamentous, as long as the corolla tube, the stigmas linear, to 2.2 mm long; ovarian disc mound-shaped, exceeding the calyx. *Fruits* oblong, to 1 cm long, to 0.7 cm wide, often falcate (1 seed aborted?), delicately costate, glabrous, drying black.

22. **Palicourea tumidonodosa** Dwyer.[78] Panama, *Gentry & Mori 13787* (MO, holotype).

Trees to 5 m tall, the twigs smooth, glabrous, black when dry, the nodes crowded, turgid (persistent stipules). *Leaves* elliptic, 6–13 cm long, 4.5–5.5 cm wide, deltoid toward the apex, acuminate, the acumen scarcely evident, ultimately obtuse, acute or attenuate acute toward the base, the costa prominulous above, subprominent beneath, the lateral veins ca. 13, arcuate, not forming an undulate marginal vein, the margin thinly callose, stiffly chartaceous, discolorous, glabrous; petioles stiff, ascending, to 2 cm long, ca. 0.1 cm wide, glabrous; stipules perhaps connate toward the base, compressed cup shaped, turgid, ca. 0.5 cm long, subtruncate or rounded at the apex, scarious, glabrous, the margin entire or minutely retuse and ciliolate. *Inflorescences* terminal, solitary, paniculate, to 13 cm long, to 5 cm wide; peduncle 1.0–3.5 cm long, the branches opposite, ascending, the lowermost well spaced, to 4 cm long; bracts and bracteoles ovate triangular or oblong, to 3 mm long, acute or obtuse, glabrescent. *Flowers* (in bud) sessile; hypanthium inconspicuous, 0.3 mm long, the calycine cup short, 0.5 mm long, scarcely turgid, the lobes 5, oblong, 1.5 mm long, stiffly petaloid, the hairs short, ascending, white; corolla green (in bud), the tube cylindrical, puberulent outside, within with elongate, ascending hairs at base, the wall stiffly carnose, the lobes cucullate; anthers oblong, 1.3 mm long, obtuse. *Fruits* not seen.

Palicourea tumidonodosa is known only from Panama. It is distinguished by its swollen stipules which are without awns. Noteworthy is the fact that the leaves are glabrous.

PANAMÁ: Cerro Mali, base camp near Colombian border, lower montane wet forest, 1500 m, *Gentry & Mori 13787* (MO).

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[78] *Palicourea tumidonodosa* Dwyer, spec. nov. *Arbores* ad 5 m altae ramulis glabris. *Folia* elliptica, 6–13 cm longa, 4.5–5.5 cm lata, versus apicem deltoidea venis lateralibus ca. 13, rigido-chartacea glabra; petiolis ad 2 cm longis; stipulis fortasse versus basin connatis compresso-cupuliformibus turgidis ca. 0.5 cm longis, apice subtruncatis vel rotundatis. *Inflorescentiae* paniculatae ad 13 cm longae, ad 5 cm latae, pedunculo 1.0–3.5 cm longo; bracteis bracteolisque ovato-triangularibus vel oblongis, ad 3 mm longis. *Flores* sessiles; cupula calycis dentibus 5 oblongis, ca. 1.5 mm longa; corolla tubo cylindrico; antheris ca. 1.3 mm longis. *Fructus* non visi.

23. **Palicourea veraguensis** Dwyer.[79] TYPE: Panama, *Mori & Dressler 7796* (MO, holotype).

Trees 2–5 m tall, the branchlets glabrous or with dense, irregular, stiff, curled hairs, often drying brown, the nodes moderately well spaced or ultimately crowded. *Leaves* oblong, 3–10 cm long, 0.8–4.0 cm wide, obtuse or acute at the apex, acuminate, the acumen to 1.5 cm long, acute, cuneate to obtuse at the base, the costa slender, subplane above, prominulous to subprominent beneath, often drying red, the lateral veins 11–13, arcuate, prominulous beneath, with 1–2 veins of comparable prominence between 2 lateral veins, the intervenal areas reticulate, papyraceous, somewhat discolorous, drying a deep brown above, with a few scattered stiff hairs beneath on the costa and the veins, the margin occasionally lightly revolute; petioles to 1 cm long, glabrous to densely pubescent, often deflexed; stipules persistent, connate, turgid, 5.5–1.0 cm long, the sheath bowl shaped, each part with 2 subulate awns, as long as or longer than the sheath. *Inflorescences* terminal, cymose pyramidal paniculate, 5–15 cm long, 4.5–10.0 cm wide; peduncle 2.3–5.5 cm long, ca. 0.25 cm wide, densely golden villose, yellow, often drying dark red, the branches few, the lowermost 2–4 cm long; lowermost bracts oblong, to 1.5 cm long, 0.1 cm wide, densely villose. *Flowers* with pedicels to 3 mm long, puberulent, the calycine cup 0.8 mm long, glabrous, the teeth 5, widely triangular, 0.3–0.5 mm long; corolla with the tube cylindrical, perhaps not dilated at the base, to 6.5 mm long, ca. 1.7 mm wide, petaloid, glabrous outside, villose below the middle, the lobes 5, oblong, to 2.5 mm long, apically deltoid, glabrous; anthers subsessile, 1.7 mm long, attached immediately below the mouth; ovarian disc compressed oblong, 0.8 mm long; style linear, 9 mm long, stigmas wider than the style, ca. 0.5 mm long. *Fruits* (immature) pedicellate, the pedicels shorter than the fruit, turbinate, to 1.2 cm long, truncate at the apex, cuneate basally, drying black, costate, scattered tuberculate, with a few scattered hairs, the persistent calycine lobes withered, perhaps to 2 mm long.

Palicourea veraguensis is known only from Panama. It is readily distinguished by its small leaves with pubescence scattered beneath, the hairs being stiff and brown. The overall pubescence of the inflorescence is striking. The mature fruit is large for a *Palicourea* and is probably more elongate than the 1.2 cm noted, as the collectors describe the living fruit as "green." The conspicuously turbinate fruit is diagnostic.

CHIRIQUÍ: Cerro Colorado, 50 km N of San Félix, continental divide, cloud forest, 1200–1500 m, *Mori & Dressler 7796* (MO). N of San Félix at Chiriquí-Bocas del Toro border. Cerro Colorado Copper Mine Road, continental divide, 5000-5500 ft, *Mori & Kallunki 5867* (MO). VERAGUAS: Cerro Tute, *Mori 6767* (MO).

24. **Palicourea vestita** Standley, J. Wash. Acad. Sci. 18: 277. 1928. TYPE: Costa Rica, *Standley 42909* (US, holotype; F, photo).

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[79] *Palicourea veraguensis* Dwyer, spec. nov. *Arbores* 2–5 m altae ramulis glabris vel dense villosis. *Folia* oblonga, 3–10 cm longa, 0.8–4.0 cm lata, apice obtusa vel acuta acuminata venis lateralibus 11–13, papyracea supra glabra, subtus diffuso-villosa; petiolis ad 1 cm longis; stipulis ad 1 cm longis setis subulatis. *Inflorescentiae* terminales cymoso-paniculatae, 5–15 cm longae, dense villosae, ramis paucis; bracteis inferioribus oblongis, ad 1.5 cm longis. *Fructus* turbinati, ad 1.2 cm longi, truncati basi cuneati.

Shrubs 1–2 m tall, the twiglets terete, becoming angular, the hairs webby, somewhat bulbous based, the nodes well spaced, somewhat turgid with remains of stipules, the pith white. *Leaves* ascending, elliptic, 7–22 cm long, 2.5–10.0 cm wide, obtuse to deltoid at the apex, acuminate, the acumen 1.0–1.5 cm long, ultimately obtuse or acute, obtuse to cuneate at the base, the costa prominulous above, prominent beneath, the lateral veins of larger blades to 30, prominulous beneath, widely arcuate, not forming a distinct submarginal vein, usually drying yellow, with 1–2 short and soon branching smaller veins parallel to the laterals, rigidly chartaceous, often concolorous, often drying green above, usually golden hirsute on the costa and veins above, more hairy beneath including the intervenal areas; petioles to 2 cm long, rigid, webby pubescent; stipules persistent, connate, densely pubescent, the sheath turgid, bowl shaped or barrel shaped, with a median longitudinal groove or a plane glabrate area, giving a buttocks effect to each part, to 2.5 cm long, truncate, each part with 2 subulate, acute, often curved awns, these equal to or exceeding the body. *Inflorescences* yellow, usually drying yellow, terminal, paniculate, 8–18 cm long, 3.0–8.5 cm wide, the hairs dense, short, stiff; peduncle 3–9 cm long, 0.1–0.2 cm wide, the lowermost branches opposite or whorled, spreading, the uppermost branches relatively well spaced; bracts linear subulate or linear oblong, to 0.8 cm long, pubescent, curled. *Flowers* with pedicels ca. 0.5 cm long; hypanthium somewhat turbinate, ca. 1 mm long, densely golden pubescent, the calycine cup apparently absent, the lobes 4, triangular or ovate, ca. 0.5 mm long, somewhat spreading, densely pubescent; corolla yellow, the tube to 13 mm long, slightly expanded at the apex and base, petaloid, minutely pubescent outside, densely villose within below the middle, the lobes 5, triangular, ca. 1.5 mm long; anthers linear oblong, ca. 2 mm long, the filaments ca. 1 mm long, attached ca. 2 mm below the mouth; style to 1.5 mm long, barely exserted, the stigmas scarcely wider than the style. *Fruits* globose, ca. 5 mm in diam., compressed laterally, pubescent, the 2 pyrenes each with 3 obtuse ribs.

Palicourea vestita is known only from Costa Rica (*Croat 26632* [MO]; *Standley 42909* [F, US]) and Panama.

COCLÉ: Near summit of El Petroso, ca. 7 km N of El Copé, ca. 800 m, *D'Arcy 11261* (MO). Cerro Pilón, 2900 ft, *Dwyer & Lallathin 8668 A* (MO, NY), *8960* (MO). VERAGUAS: Beyond Río Tres Brazos, 9 km from Santa Fé, *Croat 25598* (MO). Valley of Río Tercero Braso beyond Escuela Agricola Alto Piedra above Santa Fé, primary forest along road, *Croat 27341* (MO). Cerro Tute, *Folsom & Edwards 3357* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 6173* (MO).

64. PENTAGONIA

Pentagonia Benth., Bot. Voy. Sulph. 105. 1844. Nomen conserv. TYPE: *P. macrophylla* Benth.

Megaphyllum Spruce ex Baill., Hist. Pl. 7: 456. 1880. TYPE: Brazil, Spruce herb., *6230* (K, not seen).
Seemannia Hook., J. Bot. 7: 567. 1848. Nomen rejic. TYPE: Panamá, *Seemann* (K, not seen).
Watsonamra Kuntze, Rev. Gen. Pl. 302. 1891. Nomen rejic. TYPE: *W. macrophylla* (Benth.) Kuntze.

Shrubs or small trees, rarely large trees, usually with stems simple, the stems often succulent. *Leaves* usually large, entire or pinnatifid lobed, lineolate under

magnification; petioles occasionally bearing auricles, occasionally absent; stipules free, large, acute. *Inflorescences* axillary, cymose corymbose; peduncle usually present, bracteate. *Flowers* with the hypanthium turbinate or campanulate, the calycine cup coriaceous, the wall replete with tough fibers, often with glands inside, spathaceous or 5–6-lobate; corolla funnelform or tubular, coriaceous, glabrous or villose within, the lobes 5–6, short, valvate; stamens 5–6, the anthers dorsifixed, included, the filaments equal or unequal in length, usually villose at the base, attached to the tube; ovarian disc annular or cupuliform, the stigmas narrow, obtuse, the ovary 2-celled, the ovules numerous, the placentas elongate, swollen, adnate to the septum. *Fruits* baccate, nutlike when dry, globular, often lenticellate; seeds numerous, obtusely angular, the testa thin.

Pentagonia occurs in Central America and in most countries of tropical South America. It is a genus of about 25 species.

Excluded Species:

Pentagonia magnifica Krause, Bot. Jahrb. Syst. 40: 325. 1908. TYPE: Colombia, *Lehmann 8886* (B, not seen; NY, isotype; photo, MO).
Watsonamra magnifica (Krause) Standley, Contr. U.S. Natl. Herb. 17: 441. 1914.

When Standley effected the new combination in 1914, he remarked of *Pittier 4148* (US) from the Rio Culebra, above Santa Isabel, Province of Colon, Panama: "It is impossible to be certain that the Panama specimen is of this species, since it is in fruit, and even the persistent calyces are mutilated so that their form cannot be determined definitely." I have examined Pittier's collection and agree with Standley. The solitary leaf of the Pittier collection measures 78 cm × 29 cm, is not lobed, and is sessile. The lack of a petiole precludes it from being *P. macrophylla*. The inflorescence is much reduced and branches in a deliquescent fashion. The fruit is oblong, measuring 2 cm in width and about 3 cm in length; the persistent calycine lobes are about 1 cm long.

a. Leaves entire, not pinnatifid lobed.
  b. Leaves sessile ---------- 10. *P. wendlandii*
  bb. Leaves obviously petiolate.
    c. Subshrubs 1.0–1.5 m tall; leaves small, to 22 cm long; hypanthium and calyx to 6 mm long ---------- 9. *P. veraguensis*
    cc. Shrubs or trees; leaves large, 25–45(–100) cm long.
      d. Shrubs or small trees, to 7 m tall; fruits to 2.8 cm wide.
        e. Corolla lobes 5.5–7.0 mm long; anthers dimorphic, the larger to 8.5 mm long ---------- 5. *P. macrophylla*
        ee. Corolla lobes 10–12 mm long; anthers all alike ca. 4 mm long ---------- 2. *P. bocataurensis*
      dd. Trees to 17 m tall; fruits ca. 4 cm wide ---------- 6. *P. nuciformis*
aa. Leaves pinnatifid lobed.
  f. Leaves subsessile (the blades often appearing petiolate as they narrow to a slender wing on the costa) ---------- 8. *P. tinajita*
  ff. Leaves obviously petiolate.
    g. Petioles with conspicuous auricles.
      h. Auricles ca. ¼ the length of the petiole, not drying red, the margin undulate; calycine lobes ca. 3 mm long ---------- 3. *P. brachyotis*
      hh. Auricles occupying ca. ½ the length of the petiole, usually drying red, the margin erosulose or crisp, often with subulate processes; calycine lobes 4–7 mm long ---------- 7. *P. pinnatifida*
    gg. Petioles lacking auricles.
      i. Petioles ca. 15 cm long; corolla tube ca. 45 mm long, the lobes ca. 0.6 mm long ---------- 1. *P. alba*

ii. Petioles (3.0–)5.0–8.5 cm long; corolla tube ca. 20 mm long, the lobes ca. 10 mm long ---------- 4. *P. gymnopoda*

1. **Pentagonia alba** Dwyer.[80] TYPE: Panama, *Bristan 1224* (MO, holotype; isotype NY).

Small *shrubs,* the stems not seen. *Leaves* (only one seen) pinnately lobed, about 8 lobes on each side, the rachis between the lobes 1–3 cm wide, to 24 cm long, to 7 cm wide, acute toward the apex, scarcely acuminate, the lateral veins of each lobe ca. 8, arcuate, stiffly papyraceous, glabrous above except for the costa, puberulent beneath; petioles to 15 cm long, 0.5 cm wide in the middle, the base swollen, to 1.3 cm wide; stipules not seen. *Inflorescences* axillary, the few flowers on a reduced peduncle. *Flowers* sessile; hypanthium ca. 0.5 mm long, glabrous, the calycine cup expanded, ca. 0.7 cm long, glabrous with oblong glands within arranged in rows, the lobes 5, oblong lanceolate, ca. 10 mm long; corolla white, the tube funnel shaped, 4.5 cm long, ca. 0.3 cm wide at the base, 1.7 cm wide at the apex, thinly carnose, glabrous outside, villose within at the point of filament attachment, the lobes 5, oblong rotund to subtriangular, 0.6 mm long; stamens 5, the anthers oblong, 2.5–3.0 mm long, the filaments 11–13 mm long, unequal, 2 short, 2 intermediate in length, and one elongate; style (in bud) slender, the stigmatic area oblong, the lobes 2. *Fruits* not known.

Pentagonia alba is known only from Panama. It is immediately distinguished from all other *Pentagonia* of the Republic by the combination of pinnatifid lobed leaf blades with a winged "rachis" in the interlobular areas and white flowers.

DARIÉN: Cerro Pirre, *Bristan 1224* (MO, NY).

2. **Pentagonia bocataurensis** Dwyer.[81] TYPE: Panama, *Cooper & Slater 53* (F, holotype).

?*Shrub,* branches slender. *Leaves* entire, to 1 m long. *Flowers* with the hypanthium short, the calycine cup oblong, ca. 1.2 cm long, coriaceous, golden puberulent outside, glabrous within and with clusters of glands within, the lobes perhaps 5, unequal, triangular oblong to widely subulate, 0.4–0.8 mm long, acute, ciliolate; corolla with the tube cylindrical, 3.5–5.0 cm long, puberulent outside, glabrous within, coriaceous, the lobes 5, narrowly oblong, 10–12 mm long, often acute; stamens 5, the anthers oblong, ca. 4 mm long, the filaments 1.8–2.0 mm long, villose, especially below the middle; style linear, 30 mm long or longer, the stigmas 2, oblong, ca. 5.5 mm long, ca. 2 mm wide, obtuse. *Fruits* not seen.

The new species is known only from Panama. The holotype was annotated

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[80] *Pentagonia alba* Dwyer, spec. nov. *Frutices* parvi. *Folia* pinnatiformi-lobata, lobis angusto-lanceolatis, ad 24 cm longis, ad 7 cm latis, lobis terminalibus 3, inferioribus 2 aequalibus apicem versus acutis venis lateralibus lobi utriusque ca. 8; petiolis supra leviter angusto-alatis, ad 15 cm longis. *Flores* sessiles, cupula calycis ca. 0.7 mm longa, lobis ca. 10 mm longis; corolla alba, ca. 4.5 cm longa, lobis 5, ca. 0.6 cm longis; antheris 2.5–3.0 mm longis, filamentis inaequalibus.

[81] *Pentagonia bocataurensis* Dwyer, spec. nov. *Folia* ad 1 m longa. *Flores* cupula calycis ca. 1.2 cm longa lobis fortasse 5, 0.4–0.8 mm longis in margine ciliolata; corolla tubo 3.5–5.0 cm longo, extus aureo-puberulo, lobis 5 angusto-oblongis, 10–12 mm longis acutis; staminibus 5, antheris oblongis, ca. 4 mm longis, filamentis brevibus, villosis. *Fructus* non visi.

by Standley many years ago as *Pentagonia magnifica* Lehmann, a species originally described from *Lehmann 8886* from the Rio Timbique, Colombia. *P. magnifica*, however, has 5 unequal calycine lobes which are obtuse at the apex while in the new species the lobes are acute at the apex; *P. magnifica* has a much shorter corolla, has shorter staminal filaments, linear anthers, and a much shorter style.

BOCAS DEL TORO: Changuinola, *Cooper & Slater 53* (F).

3. **Pentagonia brachyotis** (Standley) Standley, J. Wash. Acad. Sci. 17: 171. 1927.

Watsonamra brachyotis Standley, Contr. U.S. Natl. Herb. 17: 443. 1914. TYPE: Panama, *Williams 999* (F, holotype).

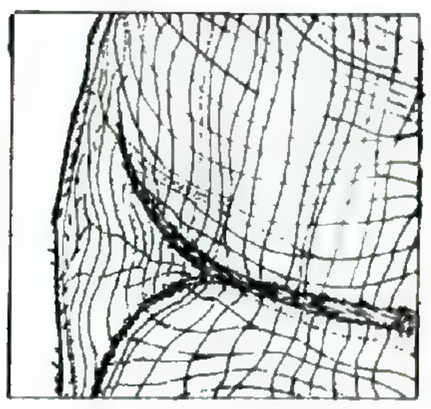
Shrubs to small trees, 0.75–3.00 m tall, the stems glabrous, lenticellate. *Leaves* pinnatifid lobed, the lobes 4–6 per side, the entire blade rhombic, 33–70 cm long, to 42 cm wide, cuneate at the apex, the lateral lobes 4–9 cm wide, cuneate and ultimately acute or obtuse at the apex, the blades subtruncate to broadly cuneate at the base, the interlobular areas or sinuses 0.2–4.0 cm, thinly coriaceous or papyraceous, glabrous to puberulent; petioles to 14 cm long, conspicuously auriculate at the base, the auricles rounded, 4–7 cm long, membranous, the margin undulate, red; stipules ovate oblong, to 3.5 cm long, to 1.2 cm wide, acute, appressed puberulent on the outside. *Inflorescences* axillary, ca. 4 cm wide, the flowers congested, the peduncle much reduced. *Flowers* 5-merous, sessile; hypanthium 0.5 cm long, appressed pubescent, the calycine cup subcampulate, to 2 cm long, 1 cm wide, appressed pubescent outside, glabrous within, with rows of oblong glands below the sinuses, the lobes widely triangular or oblong, to 3 mm long, ciliolate; corolla tube cylindrical, to 3 cm long, 0.5 cm wide, glabrate, coriaceous, the lobes triangular, to 0.3 cm long; anthers subsessile, oblong, 3.5 mm long, attached near the mouth, the filaments pilose beneath; style 1.5–2.0 cm long, the stigmas oblong rotund, ca. 3 mm long. *Fruits* sessile, ovate to ovate rotund, to 3 cm long, to 2 cm wide, truncate, drying red brown, conspicuously lenticellate, minutely rugulose, the calycine cup barrel shaped, to 0.8 cm long, the 5 narrowly oblong lobes slightly longer than the tube, glabrous to puberulent outside.

Pentagonia brachyotis is known only from Panama. *Elias 1785* (MO) from the Rio Mulatupo, San Blas, is probably *P. brachyotis*. It is in fruit. The fruits are sessile, rotund, to 2 cm in diam., lignose, lenticellate, and the persistent calyx is 1.8 cm long. On this collection the petioles are not intact in the specimen and no auricular appendages are visible.

COLÓN: Santa Rita Ridge Trail, 17–35 km from the Boyd-Roosevelt Highway, 400–800 m, *Mori & Kallunki 6349* (MO). DARIÉN: Summit of Cerro Pirre, 1000–1400 m, *Gentry & Clewell 7046 A* (MO). Caná-Cuasí Trail (Camp 2), Chepigana, *Terry & Terry 1426* (F, MO). Marragantí, *Williams 999* (F). PANAMÁ: Stream flowing out of Serrania de Maje, *Folsom & Collins 1714* (MO). SAN BLAS: Río Chico, Yaviza, *Burch et al. 11241* (F, MO, US). Permé, *Cooper 252* (F, US).

4. **Pentagonia gymnopoda** (Standley) Standley, J. Wash. Acad. Sci. 17: 171. 1927.

Watsonamra gymnopoda Standley, Contr. U.S. Natl. Herb. 17: 444. 1914. TYPE: Panamá, *Pittier 3858* (US, holotype; NY, isotype).



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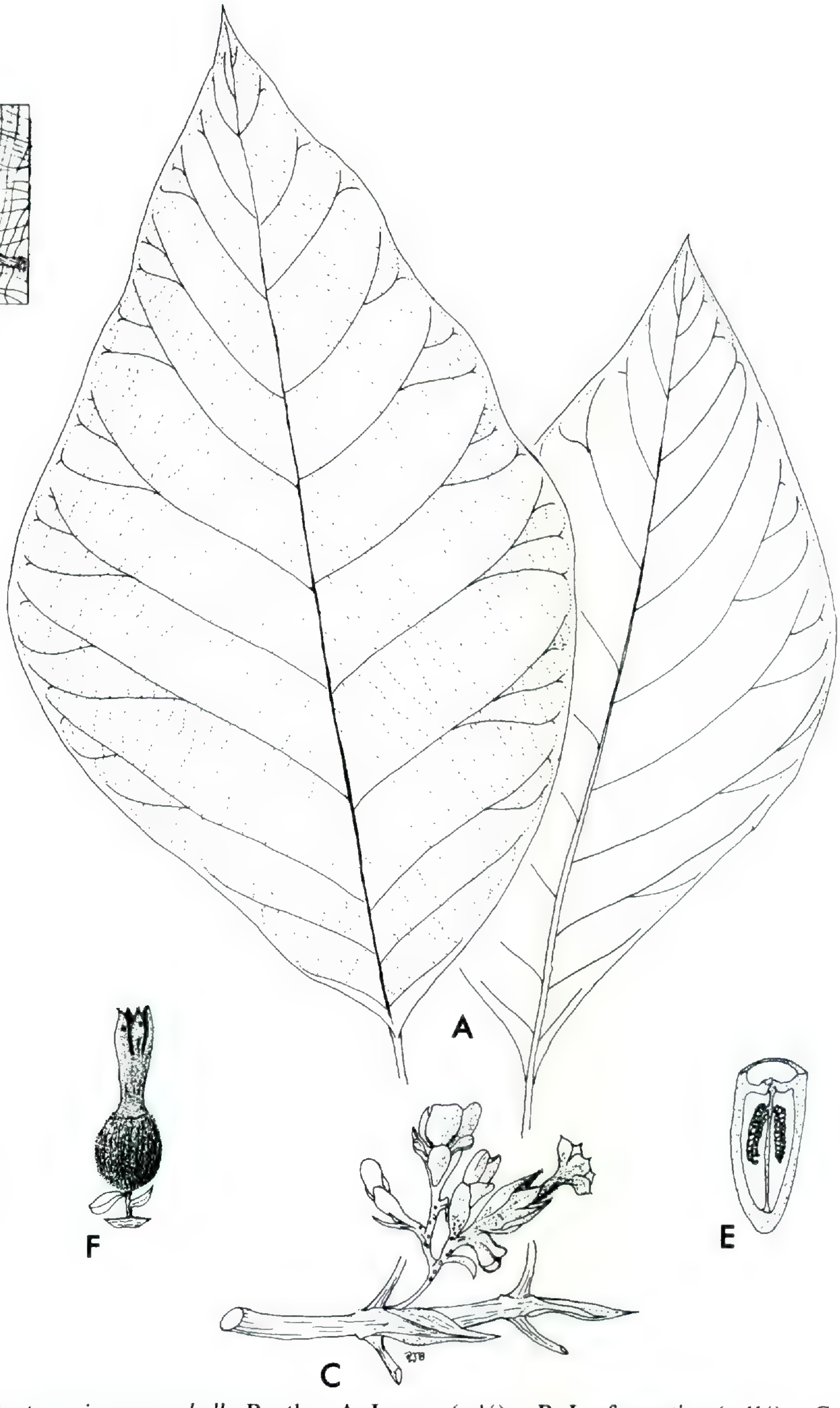

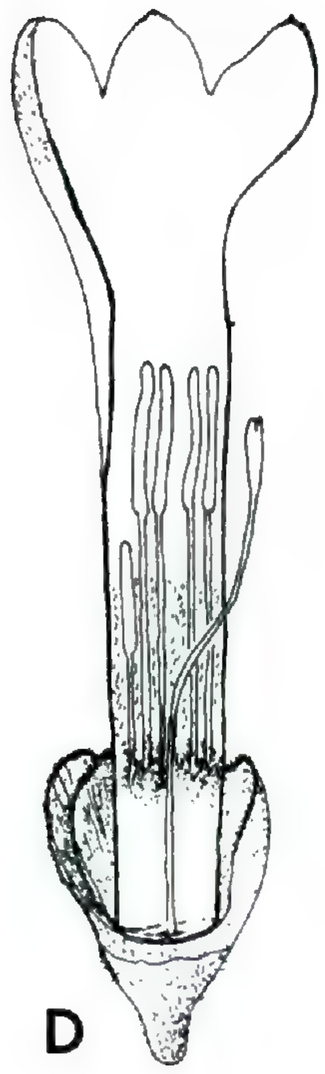

D

F

A

C

E

FIGURE 68. *Pentagonia macrophylla* Benth.—A. Leaves (×¼).—B. Leaf venation (×1½).—C. Inflorescence (×½).—D. Flower, part of perianth removed (×1½).—E. Ovary, longitudinal section (×3). [After *Croat 16542.*]—F. Fruit (×½). [After *Duke 4270.*]

Shrubs or trees to 4 m tall, the branches lignose, puberulent, the leaves crowded at the tips. *Leaves* in bud bursting out of the terminal stipules, oblong, to 1 m long or longer, to 70 cm wide or wider, deeply pinnatifid lobed, the lobes 6–13, the terminal portion 3-lobed, the median lobe either ovate oblong or obovate oblong, as long as the 2 lateral lobes, the latter oblong, usually narrowly so, 5–25(–35) cm long, 2–8(–9) cm wide, cuneate at the apex, 2–8 cm apart, the sinuses subacute or rounded, extending almost to the rachis, the rachis and the winglike portion of the blade 0.5–3.0 cm wide, the costa prominulous above, prominent beneath, to 0.25 mm wide, minutely pubescent, the secondary veins 6–9, usually one for each lobe, the branches of the secondary veins ca. 6 per lobe, thickly herbaceous to stiffly chartaceous; petioles (3.0–)5.0–8.5 cm long, subterete, lacking auricles, dilated proximally; stipules ovate lanceolate, to 6.5 cm long, to 2.5 cm wide, acute, coriaceous, strigillose or glabrate outside. *Inflorescences* densely flowered, the peduncle to 1 cm long; bracts oblong, to 3 cm long, strigillose and ciliate. *Flowers* sessile; hypanthium ca. 1 cm long, the hairs appressed, dense, the calycine cup somewhat expanded, 0.5–0.7 cm long, coriaceous, tuberculate outside, minutely puberulent outside, glabrous within, with a few oblong glands at the base, the lobes 5, oblong rotund, somewhat unequal, 8–10 mm long, to 10 mm wide, glabrous within, scarious margined, ciliolate; corolla white, yellow or pale green, the tube narrowly cylindrical, ca. 20 mm long, coriaceous, puberulent outside, densely bearded within at the point of filament attachment, the lobes 5, oblong, ca. 10 mm long, glabrous within; stamens 5, the anthers oblong, ca. 3 mm long, the filaments unequal, 8–10 mm long, 2 short, 1 intermediate, and 2 long, bearded basally, attached ca. 8 mm from the base of the tube; style 9 mm long, the stigmatic area ca. 4 mm long, the stigmatic lobes unequal, concave, 1 narrow, ca. 0.8 mm wide, the other ca. 1.5 mm wide, both pubescent adaxially. *Fruits* sessile, ovate, pear shaped or subrotund, to 2 cm long, usually truncate at the apex, densely lenticellate, the persistent calyx to 2 cm long, the base of the calycine tube set within a delicate ringlike scar.

Pentagonia gymnopoda is known only from Panama. *Nee 10528* and *Dwyer 1385* report the fruit as purplish brown.

COLÓN: Loma de Gloria, Fató, *Pittier 3858* (BM, NY, US). DARIÉN: Airstrip at Caná gold mine, *Croat 37986* (MO). PANAMÁ: El Llano-Cartí Road near Gorgas Mosquito Control Project at km 12, *Croat 26026* (MO). Cerro Jefe, *Duke 9354* (MO). Cerro Azul, *Dwyer 1385* (MO, US), *7072* (MO). Cerro Jefe, 3100 ft, *Gentry 3508* (MO). Cerro Azul, 2–3 mi S of Goofy Lake, *Lewis et al. 292* (GH, MO, US). Cerro Jefe and La Eneida, *Luteyn & Foster 1130* (MO). El Llano-Cartí Road, *Mori & Kallunki 2856* (MO). El Llano-Cartí Road, ca. 10 km from the Panamerican Highway, 350 m, *Mori & Kallunki 3535* (MO); *Nee 10528* (MO).

5. **Pentagonia macrophylla** Benth., Bot. Voy. Sulph. 105. *tab. 39.* 1845. TYPE: Panama, *Bentham* (K, holotype, not seen).—FIG. 68.

Watsonamra macrophylla (Benth.) Kuntze, Rev. Gen. Pl. 302. 1891.
W. pubescens Standley, Contr. U.S. Natl. Herb. 17: 441. 1914. TYPE: Panama, *Pittier 3822* (US, holotype; NY, isotype).

Trees to 7 m (or to 16 m?), the nodes crowded at the apex of the stem. *Leaves* ovate rotund, oblong, or rhombic rotund, to 45 cm long, to 24 cm wide, widely

deltoid at the apex, basally cuneate, rounded or occasionally truncate, often inequilateral, the costa prominent above and beneath, the lateral veins 12–15, coriaceous, glabrous above, minutely sericeous on the veins beneath; petioles to 14 cm long, 0.3–0.5 cm wide in the middle, not strongly dilated basally; stipules free, triangular, 3.5–4.0 cm long, ca. 1.5 cm wide at the base, coriaceous, glabrous or golden puberulent. *Inflorescences* axillary, sessile or pedunculate, the cymes with few to many flowers aggregated usually into a rotund mass shorter than the petiole; bracts red. *Flowers* yellow; hypanthium obovate rotund, 0.6–0.8 cm long, coriaceous, glabrous, the calycine lobes 5, erect, oblong, 0.6–0.9 cm long, obtuse, concave, coriaceous, moderately pubescent, with a cluster of minute, oblong glands within at the sinuses; corolla with the tube cylindrical, 3.5–4.0 cm long, to 1 cm wide, puberulent outside, densely golden villose within near filament attachment, the lobes 5, spreading or scarcely reflexed, ovate oblong, 5.5–7.0 mm long, acute, villose marginally, smooth; stamens 5, included in the tube, the anthers perhaps dimorphic, the smaller saucer shaped, ca. 3.5 mm long, the pollen aborted?, the larger to 8.5 mm long, polleniferous, the filaments linear subulate, 1.2–2.0 cm long, differing slightly in length, ca. 1.3 mm wide at the base, attached below the middle of the tube, densely villose basally on the adaxial side; style linear, 2.0–2.5 cm long, ca. 0.8 mm wide, the stigmas 2, spread at anthesis, oblong rotund, 3–4 mm long, obtuse. *Fruits* rotund, to 2.8 cm in diam., nutlike, villosulose, the calycine cup 1.5–2.0 cm long, the lobes lanceolate, narrow oblong or subrotund, to 1.3 cm long, equal to or exceeding the cup in length, the wall of the fruit ca. 0.35 cm in diam.

Pentagonia macrophylla is known only from Panama, the Dept. Choco, Colombia, and Ecuador. "Hoja de Murcielago." *Folsom & Robinson 2381* has exceptionally small leaves measuring only 19–25 cm in length.

BOCAS DEL TORO: Quebrada Huron, *Kirkbride & Duke 425* (MO). Isla Colón, *Lao 93* (MO); *Wedel 481* (MO). Chiriquí Lagoon, *Wedel 1561* (F, MO). Old Bank Island, *Wedel 1931* (F, MO). Chiriquí Lagoon, *Wedel 2535, 2873* (both MO, US). CANAL ZONE: Frijoles, *Allen 926* (MO). Río Chagres, *Allen 874* (MO). Juan Mina, *Bartlett & Lasser 16555* (MO). Without other locality, *Blum & Tyson 2322* (MO). Pipeline Road, *Croat 12364* (MO). Road between Gatún and Piña, 3 km S of Piña, *Croat 36931* (MO). Coco Solo, *Duke 4270* (MO). Galena Point, *Dwyer & Robyns 161* (MO). Gatún Lake, NW shore, *Dwyer 1816* (GH, MO, US). Summit and Gamboa, *Greenman & Greenman 5217* (MO). Pipeline Road, *Hayden 69* (MO). Río Indio, *Lao & Holdridge 54* (MO). Pipeline Road, *Lewis et al. 5458* (MO, SCZ, UC). Fort Sherman, *Maxon & Valentine 6987* (US). Railroad, 6 km W of Gamboa, *Nee 7206* (MO). 2 km W of Gamboa, *Nee 7531* (MO). Pipeline Road, 1½ km NW of Gamboa, *Nee 9584* (MO). Gatuncillo, *Piper 5602* (US). Tabernilla, *Pittier 3822* (F, US). Agua Clara, *Pittier 3992* (NY, US). Frijoles, *Standley 27421, 27497, 27565* (all US). Gamboa, *Standley 28422* (US). Fort Randolph, *Standley 28691* (MO, US). Fort Sherman, *Standley 31034* (US). Obispo, *Standley 31696* (US). Fort Sherman, *Tyson 3809* (MO); *Tyson & Blum 1667* (MO). BARRO COLORADO ISLAND: *Bailey & Bailey 135* (F); *Bangham 440* (F); *Brown 135* (F); *Croat 4128, 4646, 4685, 5453, 5821, 6220, 6244, 8167, 10355, 14580, 16542* (all MO); *Ebinger 58* (MO, US); *Foster 1052* (F); *Hayden 11, 32* (both MO); *Kenoyer 545* (US); *Knight 69-3* (MO); *Luteyn 1350* (F); *Maxon et al. 680* (MO); *Oppenheimer 6609-14-1305* (MO); *Robyns 65-15* (MO); *Shattuck 1049* (MO); *Standley 31328, 31455, 40789* (all US); *Starry 21* (MO), *142* (F, MO); *Woodson & Schery 963* (MO). COCLÉ: El Valle, *Allen 2801* (F, MO), *3736* (F). Alto de Calvario, 7 km N of El Cope, 700 m, *Folsom 4097* (MO); *Folsom & Robinson 2381* (MO). Boca del Toabre, *Lewis et al. 5542* (BM, MO). COLÓN: Camp Piña, *Allen 3580* (F). Río Indio, road from Portobelo to Nombre de Dios, *Croat 33633* (MO). Icacal between Salud and Boca, *Howell 234* (MO). Piña, *Kirkbride & Hayden 318* (MO). Fort San Lorenzo, *Quistgaard 26* (MO). Road to Río Indios, 3 km S of Piña, *Sullivan 130* (MO). DARIÉN: Cerro Pirre, *Bristan 557* (MO); *Duke 4842* (MO). PANAMÁ: Chagres, *Fendler 208* (MO). Cerro Trinidad, *Kirkbride & Duke 1678* (MO). 5–10 km NE of Altos de Pacora, ca. 750 m, *Mori & Kallunki 4978* (MO). El Llano Cartí

Road, 5 km N of Panamerican Highway, *Nee 7935* (MO). Arenoso, *Seibert 599* (MO). SAN BLAS: Headwaters of Río Cuadí, Camp Diablo, *Duke 3649* (MO, UC).

6. **Pentagonia nuciformis** Dwyer.[82] TYPE: Panama, *Croat 23093* (MO, holotype).

Trees to 17 m tall, the twigs terete, ultimately angular, the nodes moderately crowded; petiole scars oblong or obovate rotund, to 1 cm long. *Leaves* oblong, entire, 15–30 cm long, 5–16 cm wide, widely rounded or widely deltoid toward the apex, scarcely acuminate or with the acumen to 1 cm long, the costa prominulous above and ridgelike, prominent beneath, the lateral veins 12–14, at first strict, then arcuate toward the margin, the intervenal areas lineolate, thinly coriaceous, glabrous; petioles 2–4 cm long, slightly dilated at the base, glabrous; stipules free, deltoid oblong, to 4 cm long, to 2 cm wide, acute, glabrous, coriaceous, black when dry, with 2 well-spaced proximal keels converging toward the apex. *Flowers* not seen. *Fruits* ca. 15, axillary, oblong or subrotund, often angular, to 4 cm long, to 3 cm wide, nutlike, lignose, glabrous but with minute, brown scales, deciduous, the persistent calycine cup 0.3–0.5 cm long with a few glands within, the glands to 5 mm long, the lobes 5, often withered, oblong, equal to or longer than the tube, the pericarp lignose, to 4 mm thick, smooth and lightly reticulate within; seeds abundant, disposed as 2 oblong rotund clusters when dry, to 2 cm long, the individual seeds oblong, ca. 7 mm long, angular, shiny, minutely honeycombed in appearance.

Pentagonia nuciformis is known only from Panama. The height of the tree and the large fruits immediately distinguish it from all other Central American species of the genus. Croat (pers. comm.) considers it strikingly different from the several species of *Pentagonia* with which he is familiar in the field; he points out that the tree branches freely. This is noteworthy as *Pentagonia* usually has a simple trunk.

VERAGUAS: 5 mi W of Santa Fé on the road past Escuela Agricola Alto Piedra, Pacific side of divide, 800–1200 ft, *Croat 23093* (MO).

7. **Pentagonia pinnatifida** Seem., J. Bot. (Hooker) 7: 566. 1848. TYPE: Panamá, *Seemann 1019* (BM, not seen, photo MO).

Pentagonia pittieri (Standley) Standley, J. Wash. Acad. Sci. 17: 170. 1927.
Watsonamra pittieri Standley, Contr. U.S. Natl. Herb. 17: 443. 1914. TYPE: Panamá, *Pittier 4298* (US, holotype; F, NY, isotypes).

Shrubs to 3 m tall, the stems terete, lignose, glabrous. *Leaves* crowded terminally, oblong, to 1 m or more in length, deeply lobed and pinnatifid, the individual lobes narrowly oblong, to 45 cm long, to 10 cm wide, tapering deltoidly,

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[82] *Pentagonia nuciformis* Dwyer, spec. nov. *Arbores* ad 17 m altae. *Folia* oblonga, 15–30 cm longa, 5–16 cm lata, versus apicem lato-rotunda vel late deltoidea vix acuminata vel acumine ad 1 cm longo praedita, venis lateralibus 12–14, tenui-coriacea glabra; petiolis 2–4 cm longis; stipulis liberis deltoideo-oblongis, ad 4 cm longis, basi 2 cm latis. *Fructus* ca. 15 in subrotundum fasciculum infra verticillos terminales foliorum congesti oblongi vel subrotundi, ad 4 cm longi, ad 3 cm lati, nuciformes lignosi glabri sed squamis brunneis minutis deciduis praediti cupula calycis persistente ca. 0.5 cm longa, intus glandulis, ad 0.5 mm longis praedita, lobis 5 saepe marcidis tubo aequalibus vel quam longioribus, pariete fructus ad 4 cm crasso; seminibus multis in massas duas oblongo-rotundas aggregatis.

the apex of the blade 3-lobed, the median of these ovate oblong, ca. 3 times longer than the lateral pair of apical lobes, the costa prominent above and beneath, convex beneath, to 0.6 cm wide, the lateral veins usually 1 per lobe, the secondary veins simulating lateral veins in each lobe, ca. 7, arcuate, prominulous, the finest veinlets lineolate, thinly coriaceous, glabrate above, puberulent on the veins beneath; petioles to 17 cm long, probably longer in the larger leaves, lignose, dilated proximally, glabrescent, with large foliaceous basal auricles, subrotund, to 7.5 cm long, ca. 8 cm wide basally, fleshy and red, the margin erosulose or crisp, often with marginally subulate processes, to 2 cm long, ca. 0.1 cm wide, minutely puberulent; stipules free, lanceolate to triangular subulate, to 5.5 cm long, sericeous outside. *Inflorescences* axillary, to 6 cm long, the cymules densely flowered. *Flowers* with the hypanthium ca. 5 mm long, sericeous, the calycine cup subcampanulate, 3–4 times the length of the hypanthium, constricted basally, thinly coriaceous, minutely sericeous outside, glabrous within, the lobes oblong, 4–7 mm long, obtuse; corolla tube ca. 2.5 cm long (fide Standley), appressed pilose. *Fruits* sessile, orange, rotund, ca. 2 cm in diam., minutely pubescent to glabrate, minutely rugulose but not scaly, the persistent calyx as long as or longer than the fruit.

Pentagonia pinnatifida is known only from Panama and Colombia. It is easily distinguished from other *Pentagonia* of Panama except *P. brachyotis* by its pinnatifid leaves and petioles bearing large foliaceous auricles. Among the Choco the fruits are eaten, and the leaves and fruits are "taken in a tea as a blood purifier" (fide Duke). "Biruchichiho."

DARIÉN: Río Chico, from Yaviza at Río Chucunaque to ca. 1 hour by outboard from junction, *Burch et al. 1124* (F, GH, K, MO, NY, UC, US). Río Pirre, *Croat & Porter 15501* (MO). 2–3 mi SE of El Real, *Duke 4842* (MO). 10 mi S of El Real on Río Pirre, *Duke 5468* (MO). Quebrada Bidoto (Peccary Creek) off Río Aretí, *Duke 13599* (MO). Quebrada "Camachimuricate," Casa de Bartolo, *Kennedy 2857* (MO). Manene to Río Cuasí, *Kirkbride & Bristan 1401* (MO). From Pinogana to Yaviza, *Stern et al. 136* (MO, US). PANAMÁ: Río Maje, above first waterfall, 50 m, *Croat 34419* (MO). Trail between Río Maje and Quebrada Brava, 2 mi upstream from waterfalls, Bayano Lake, *Croat 34740* (MO). SAN BLAS: Hill SE of Puerto Obaldía, *Croat 16733* (MO). Mainland opposite Ailigandí, *Lewis et al. 187* (GH, MO, US). Puerto Obaldía, *Pittier 4298* (F, US). COLOMBIA: CHOCO: Region Guayabal, 5 hours by foot to SE of Acandí, *Forero et al. 971* (MO).

8. **Pentagonia tinajita** Seem., Bot. Voy. Herald 134. 1854. TYPE: Panamá, David, *Seemann 1595* (BM, not seen, photo MO).

Watsonamra tinajita (Seem.) Kuntze, Rev. Gen. Pl. 302. 1891.

Shrubs to 3(–4) m tall. *Leaves* subsessile, pinnatifid lobed, 0.75–1.00 m tall, to 0.35 m wide, acute or rounded at the apex of the blade, cordate at the base, the sinuses not rounded, coriaceous, glabrous to pubescent; petioles short, the lamina decurrent (Standley: "lower portion of the blade petiolelike 8–16 cm long"); stipules ovate, to 4 cm long, acute. *Inflorescences* with the cymules densely flowered, the bracts triangular, elongate, acute. *Flowers* with the hypanthium rotund, ca. 5 mm long, the calycine cup turbinate, to 15 mm long, the calycine lobes oblong, shorter or about as long as the cup, obtuse; corolla green, cylindrical or infundibuliform, the tube ca. 2.5 cm long, the lobes 5, triangular or ovate, 6–7 mm long. *Fruits* rotund, 1.0–1.7 cm in diam., lenticellate; seeds to 3 mm long, smooth.

Pentagonia tinajita is known only from Panama. As Hooker (1849) points out concerning the specific name: ". . . (it) is taken from the fruit which resembles the water jars (tinajas) used in the country." There is a detailed figure accompanying Seemann's original diagnosis.

CHIRIQUÍ: David, *Pittier 3369* (US). San Félix, *Pittier 5214* (US).

9. **Pentagonia veraguensis** Dwyer.[83] TYPE: Panama, *Croat 27504* (MO, holotype).

Subshrubs to 1.5 m tall, unbranched, the stem terete, glabrous, the nodes well spaced, the petiole scars hemispherical or oblong, 0.5–1.2 cm long. *Leaves* rhomboid, 16–33 cm long, 6–16 cm wide, acute or deltoid toward the apex, acuminate, the acumen scarcely developed, cuneate or acute toward the base, the costa prominulous above, prominent beneath, the lateral veins 12–14, rigid, not arcuate, forking near the margin or with 1 or 3 small veins near the margin, the submarginal undulate vein lacking, the intervenal areas minutely lineolate, glabrate above, puberulent on the costa and the veins beneath, rigidly papyraceous, slightly discolorous; petioles 2.5–6.0 cm long, those in the middle ca. 0.3 cm wide, puberulent and twisted; stipules ovate lanceolate, to 3 cm long, to 1.1 cm wide at the base, subcoriaceous, glabrous, with 2 keels on the back toward the base, well spaced but converging toward the apex, glanduliferous within toward the base, the small glands oblong, to 1.5 mm long. *Inflorescences* axillary, the flowers few, the peduncle shorter than the flowers and with short scales; bracts red, crowded, deciduous, numerous, imbricate, perhaps binate, narrowly oblong, to 1.8 cm long, to 0.8 cm wide, scarious on the back, puberulent or glabrate, ciliate, glabrous within; bracteoles beneath the hypanthium oblong rotund, 8–12 mm long, otherwise like the bracts. *Flowers* with the hypanthium ca. 2.5 mm long, white puberulent, the calycine cup cylindrical, 3.5–10.0 mm long, densely minutely pubescent or glabrate within below the sinuses, the lobes 5, ovate oblong, ca. 8 mm long or longer in fruit, obtuse, glabrous within, coriaceous; corolla white or light yellow; stamens 5, the anthers oblong, to 2.5 mm long, the filaments slender, 9.0–11.5 mm long, villose at the base, arising ca. 7 mm from the base of the tube; style slender, ca. 15 mm long, the stigmas widely oblong, ca. 2.5 mm long, plano compressed, obtuse. *Fruits* sessile, oblong to rotund, to 3.5 cm long, yellow toward the base, at first rugulose then moderately smooth, the calyx red, at first persistent, to 2.5 cm long, ultimately wrinkled except for the calycine cup.

Pentagonia veraguensis is known only from Panama. It is characterized by its small size and its small rhombic leaves, although a recent indeterminate collection by *Mori & Kallunki* (*6184*) from Escuela Agricola Alto de Piedra, Veraguas, resembles this species. It is in fruit and is described by the collectors as a "slender unbranched tree, 4 m tall, 4 cm dbh." Its leaves measure to 40.5 cm and are deltoid at the apex. Unfortunately flowers were not collected.

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[83] *Pentagonia veraguensis* Dwyer, spec. nov. *Suffrutices* ad 1.5 m, ramis deficientibus. *Folia* subrhomboidea, 16–33 cm longa, 6–16 cm lata, apicem versus acuta vel deltoidea venis lateralibus 12–14, subtus in costa venisque puberula; petiolis 2.5–6.0 cm longis; stipulis ovato-lanceolatis, ad 3 cm longis, extus bicarinatis. *Inflorescentiae* floribus breviores. *Flores* cupula calycis 2.5–10.0 mm longa, lobis ca. 8 mm longis; corolla alba vel lutea; antheris ca. 2.5 mm longis. *Fructus* oblongi, ad 3.5 cm longi.

VERAGUAS: Valley of Río Dos Bocas, 11 km from Escuela Agricola Alto Piedra above Santa Fé on road to Calovébora, 450 m, *Croat 27504* (MO); *Mori et al. 3878* (MO). 16 km NW of Santa Fé, road to Calovébora, 300–500 m, *Mori & Kallunki 6128* (MO).

10. **Pentagonia wendlandii** Hook., Bot. Mag. *pl. 5230*. 1861. TYPE: not known.

Watsonamra wendlandi (Hook.) Kuntze, Rev. Gen. Pl. 320. 1891.

Shrubs to 2½ m tall, the stem unbranched, smooth. *Leaves* sessile, entire, oblong obovate, to 1 m long, to 50 cm wide, rounded or widely deltoid at the apex, tapering gradually to base, ultimately auriculate, each auricle ca. 2.5 cm wide, the costa prominulous above, prominulous to prominent beneath, the lateral veins ca. 18, prominulous above and beneath, coriaceous, glabrous to puberulent beneath, purple beneath; stipules ovate oblong or triangular, 5.0–6.5 cm long, puberulent outside. *Inflorescences* axillary, few flowered; bracts ovate lanceolate, to 1.2 cm long, obtuse, pubescent. *Flowers* sessile or subsessile, the pedicels to 1 cm long; hypanthium short, the calycine cup campanulate, ca. 1 cm long, purplish red, stiffly petaloid, pubescent outside, rugulose within, usually with numerous oblong glands within the cup near the sinuses, occasionally with an additional gland at the sinus, the calycine lobes 5, erect, somewhat unequal, most about ½ the length of the cup, the longest almost as long as the cup, often 1 lobe conspicuously short and acute; corolla yellow, the tube narrowly cylindrical, to 2.5 cm long, thickly carnose, glabrous to puberulent outside toward the apex, villose within only near point of filament attachment, the lobes triangular to oblong, 4–7 mm long, 2.2–2.6 mm wide; stamens 5, the anthers oblong, 4 mm long, obtuse, the filaments unequal, to 16 mm long, to 0.8 mm wide, densely villose at the base; style ca. 18 mm long, glabrous, the stigmas oblong, 3.5 mm long, obtuse, plane, the ovarian disc compressed cylindrical, ca. 2 mm long, thin walled, truncate, marginally undulate. *Fruits* oblong rotund, to 4.5 cm long, drying black, puberulent, the persistent calyx to 1.5 cm long.

This species has been reported only from Panama and Costa Rica. It is questionable whether the type exists; the species was "described from cultivated plants of Central American origin." The species is probably limited to Panama and Costa Rica. The flowers are described as yellowish-green, red, and yellow; the calyx is described as purplish-red or red-pink. *Dressler 4362* notes that the leaves are pink-red beneath. *Croat 33632* (MO) has a closeup (photograph) of the leaves and fruits attached to the herbarium sheet.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 187* (F, US). Quebrada Huron, Rapid Streams, *Kirkbride & Duke 425* (MO). Chiriquicito, 5 m S along Río Guaramo, *Lewis 2101* (GH, MO, US). Old Bank Island, *Wedel 2018* (MO). COLÓN: Río Indio, road from Portobelo to Nombre de Dios, 50 m, *Croat 33632* (MO). Road to Portobelo, 2 km NE of Puerto Pilón, *Nee & Tyson 10918* (MO). PANAMÁ: El Llano-Cartí Highway, 12–15 km N of El Llano, *Dressler 4362* (MO). El Llano-Cartí Road, 9.6 km from Panamerican Highway, ca. 350 m, *Mori & Kallunki 5602* (MO).

65. POGONOPUS

Pogonopus Klotzsch, Monatsber. Königl. Preuss. Acad. Wiss. Berlin 1853: 500. 1853. TYPE: *P. ottonis*.

Chrysoxylon Wedd., Monog. Cinch. 100. 1849, not *Chrysoxylon* Casar. 1843. TYPE: *C. febrifugum* Wedd.

Howardia Wedd., Ann. Sci. Nat. (Paris) Sér. 4. 1: 166. 1854, not Klotzsch, 1860. TYPE: Not specified.

FIGURE 69. *Pogonopus speciosus* (Jacq.) Schum.—A. Habit with flowers (×½). [After *Croat 12465.*]—B. Fruit (×2). [After *Croat 8959.*]

Trees or shrubs. *Leaves* with the stipules small, cuspidate. *Inflorescences* terminal, paniculate, the cymes small. *Flowers* pedicellate, the pedicels bracteolate; hypanthium turbinate, the calycine cup short, 5-dentate, one of the lobes disposed as a large stalked foliaceous blade; corolla tubular, villous within, the lobes 5, valvate; stamens 5, the anthers slender, versatile, exserted,the filaments attached to the wall of the corolla tube; ovarian disc thick, annular, the style slender, the stigmas 2, obtuse, the ovary 2-celled, the ovules numerous, longi-

tudinally adnate to the septum. *Fruits* capsular, woody, loculicidally dehiscent into 2, many-seeded valves; seeds horizontal, the testa thick.

Pogonopus occurs in Central America and tropical South America. It is a genus of about 3 species.

1. **Pogonopus speciosus** (Jacq.) Schum., Mart. Fl. Bras. 6(6): 265. 1889.—FIG. 69.

Macrocnemum speciosus Jacq., Hort. Schoenbr. 1: 19. 1797. TYPE: Not given.
Pogonopus ottonis Klotzsch, Monatsber. Königl. Preuss. Acad. Wiss. Berlin 500. 1853. TYPE: *Otto 901* (B).
Howardia grandiflora Wedd., Ann. Sci. Nat. (Paris) Sér. 4, 1: 70. 1854. TYPE: *Schlim 755* (P).
Howardia caracasensis Wedd., Ann. Sci. Nat. (Paris) Sér. 4. 1: 71. 1854. TYPE: *Funck 463* (P).
Pogonopus caracasensis (Wedd.) Nichols, Dict. Gard. 3: 175. 1886.
Carmenocania porphyrantha Wernh., J. Bot. 50: 241. 1912. TYPE: *Schlim 755* (BM).

Trees to 10 m tall, the branchlets terete, smooth, glabrous to glabrescent, often with fusiform white lenticels. *Leaves* oblong, rarely obovate oblong, 15–21(–30) cm long, 6.0–11.5 cm wide, 2 to 3 times longer than wide, usually acute, shortly acuminate, the acumen 1.5–2.0 cm long, ultimately subobtuse to acute, basally attenuate acute to cuneate, equilateral, the costa slender, subplane to prominulous above, usually prominent beneath, the lateral veins 10–12, the median veins 1.5–2.0 cm apart, arcuate, papyraceous, slightly discolorous; petioles minute or 1–3 cm long, wiry, to 0.1 cm wide, often curved, glabrous to puberulent; stipules compressed rectangular, much wider than long, to 3 mm long, the apiculum ca. 1 mm long, densely golden pubescent. *Inflorescences* terminal and axillary, usually exceeding the uppermost leaves, thrysoid cymose, spreading, glabrous, to 25 cm long, to 15 cm wide, either sessile with 2 or 3 branches from the stem tip or with peduncles 5–10(–13) cm long, wiry, often plane and twisted, the primary branches few, the pairs 2–4, opposite, 2–3 cm apart in the larger inflorescences, strict or arcuate, strongly ascending, the cymules terminal, flabellately disposed. *Flowers* with the hypanthium oblong or turbinate, ca. 3 mm long, puberulent, constricted below the calycine cup, the latter ca. 1 mm long, turgid, eglandular within, 4 of the calycine teeth subulate, to 1 mm long, the 5th expanded as a flaring foliose bract-like structure, ovate, oblong rotund or trapeziform rotund, 1–5 cm long, to 4 cm wide, acute to deltoid at the apex, occasionally vaguely acuminate, rounded or cuneate at the base with 5–7 conspicuous veins, glabrous or puberulent, the stalk slender, 1.5–2.0 cm long; corolla red or pink, the tube narrowly cylindrical, ca. 25 mm long at anthesis, constricted medially, stiffly petaloid above, subcoriaceous on the lower third, puberulent outside and in except villose inside at the filament attachment point, the lobes 5, triangular, ca. 4 mm long, erect; stamens 5, the anthers oblong, 1.5–2.5 mm long, the filaments linear, to 28 mm long, plane, often exserted to 3 mm above the mouth, attached ca. 8 mm from the base of the tube, the style linear, usually slightly exceeding the tube, puberulent, the stigmas coiled, ca. 2 mm long. *Fruits* capsular, oblong rotund, 5–7 mm long, to 6 mm wide, usually truncate, drying black, glabrous, conspicuously lenticellate, the furrow usually conspicuous; seeds round or oblong, ca. 0.4 mm in diam.

Pogonopus speciosus ranges from Mexico to Colombia and Venezuela. "Chorcha de Gallo"; "Madroño"; "Chibigui."

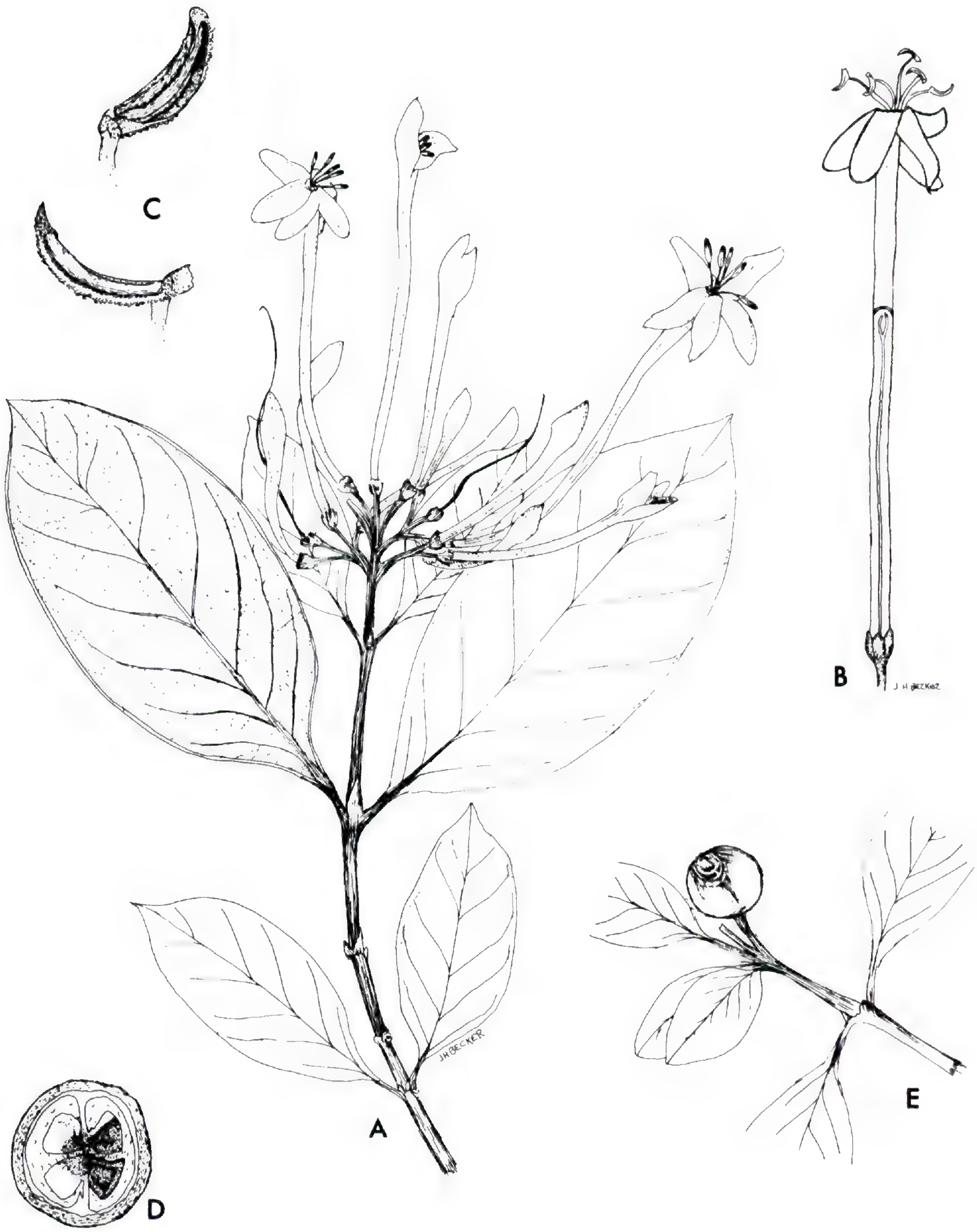

FIGURE 70. *Posoqueria latifolia* (Rudge) R. & S.—A. Habit (×½).—B. Flower (×½).—C. Stamens (×2½).—D. Ovary, cross section (×3).—D. Fruit (×½). [After *Allen 955.*]

CANAL ZONE: Fort Kobbe, *Allen 2017* (MO). Cerro Viejo on K16C, *Blum 1260* (MO). 1 mi S of Madden Dam, *Blum 2629* (MO). Madden Forest, Road 2, *Croat 8959* (MO). Road S-11, NW of Escobal, *Croat 12465* (MO). Gaillard Cut NE of Paraíso, *Croat 12511* (MO). 1 mi N of Paraíso, *Croat 12652* (MO). Near Salamanca Hydrographic Station, *Dodge et al. 16977* (MO). Madden Dam area, *Dwyer 8372* (MO). Barro Colorado Island, *Foster 1411* (MO). Madden Dam, *Lewis et al. 1* (GH, MO, UC, US). Forest Preserve Road, 1 km from Madden Dam, *Mori 421* (MO). Road C-29, 6 km ESE of Gamboa, *Nee 8846* (MO). Barro Colorado Island, *Shattuck 688* (MO). Road K-15 near Huile, *Smith et al. 3282* (MO). COLÓN: 3 mi E of Transisthmian Highway, road to Salamanca, *Gentry 6720*

(MO). 4 km ENE of Buena Vista, road to Sardinilla, *Nee 9125* (MO). DARIÉN: Cabecero del Río Pirre, *Bristan 1330* (MO). Río Aruza, *Bristan 1346* (MO). Río Yapé, *Bristan 1425* (MO). Pucro to Río Pucro, *Duke 5361* (MO). Río Sambú, 0.5 mi above Río Venado, *Duke 9290* (MO). Río Tuira between Río Punusa and Río Mangle, *Duke 14597* (MO). Río Pirre, *Duke & Bristan 8264* (MO). Río Pucro between Cerro Mali and Cerro Tacarcuna, *Gentry & Mori 13874* (MO). Río Piedras, *Stern et al. 724* (MO). Natural Bridge, Madden Lake, *Croat 12400* (MO). PANAMÁ: Río Chagres, 1 mi above Madden Lake, *Duke 4465* (MO). Panamerican Highway, 28 km E of Bayano Bridge, *Folsom 1387* (MO). Stream flowing out of Serrania de Maje, *Folsom & Collins 1729* (MO). Ipetí, base of Serrania de Maje, *Folsom & Lantz 1931* (MO).

66. POSOQUERIA

Posoqueria Aubl., Hist. Pl. Guiane 1: 133. 1775. TYPE: *P. longiflora* Aubl.

Solena Willd., Sp. Pl. 1: 961. 1797. TYPE: *S. longiflora* (Aubl.) Willd. = *Posoqueria longiflora* Aubl.
Stannia Karst., Ausw. neuer schönbl. Gew. Venez. 27. 1848. TYPE: *S. grandiflora* Karst., *S. formosa* Karst., or *S. metensis* Karst.

Trees or shrubs. *Leaves* usually large, coriaceous; stipules free, subulate to broad. *Inflorescences* cymose corymbose to umbellate; bracts minute. *Flowers* zygomorphic, 5-merous, the buds curved, the calyx 5-lobed, the lobes somewhat imbricate, auriculate at the base, glandular on the back; corolla infundibuliform or hippocrateriform, the tube elongate, glandular papillose outside, the lobes unequal, ascending, spreading or reflexed, imbricate; stamens unequal, inserted at the mouth, the anthers slender, apiculate, sagittate at the base; ovary 2-celled or incompletely 1-celled, the ovules numerous, the style elongate. *Fruits* baccoid, 2-celled; seeds numerous, large, embedded in a gelatinous pulp.

Posoqueria is found in Mexico, Central America, the West Indies, and South America. It is a genus of about 15 species.

Literature:

Steyermark, J. 1967. *Posoqueria* in Botany of the Guayana Highlands—Part VII. Mem. New York Bot. Gard. 17: 322–333.

1. **Posoqueria latifolia** (Rudge) R. & S., Syst. Veg. 5: 227. 1819.—FIG. 70.

Solena latifolia Rudge, Hist. Pl. Guiane 1: 26. 1805. TYPE: French Guiana, not seen.
Tocoyena longifolia H.B.K., Nov. Gen. Sp. Pl. 3: 411. 1819. TYPE: Not seen.
Posoqueria decora DC., Prodr. 4: 375. 1830. TYPE: Not seen.
Stannia panamensis Walp. & Duchass., Linnaea 23: 755. 1850. TYPE: "Isthmo panamensi," not seen.
Posoqueria panamensis (Walp. & Duchass.) Walp., Ann. Bot. Syst. 2: 797. 1852.
Stannia metensis Karst., Linnaea 28: 441. 1857. TYPE: Colombia, *Karsten*, not seen.

Trees to 9 m tall, the branchlets terete, ultimately angular, glabrous, the nodes 3–15 cm apart. *Leaves* oblong, ovate oblong, rarely rotund, 8–32 cm long, 3.5–22 cm wide, rounded or widely deltoid at the apex, obtuse, cuneate, acute, rarely truncate at the base, the costa plane or grooved above, prominent beneath, the lateral veins 6–8, the intervenal areas delicately reticulate, the margin usually revolute, subcoriaceous, shiny and glabrous above, glabrous to occasionally finely puberulent beneath, the petioles lignose, 0.3–2.5 cm long, glabrous, the stipules triangular, 1.0–1.3 cm long, obtuse, coriaceous, glabrous, somewhat dilated near attachment. *Inflorescences* terminal, glabrous, drying black, the elongate flowers in cymules disposed radially at the end of a short peduncle, the latter 0.5–2.2 cm

long. *Flowers* sessile or subsessile, the hypanthium oblong or turbinate, ca. 0.8 cm long, smooth, glabrous, drying black, the calycine cup shorter than the hypanthium, thickly carnose, the teeth evanescent or 5, triangular to subrotund, to 0.5 mm long; corolla white, elongate, slender, in bud having a clavate appearance, the connate lobes oblong or ovate oblong, distinctly flexed, to 1.5 cm long, obtuse, the tube 4.0–12.5(–16.0) cm long, 0.2–0.4 cm wide, glabrous outside, puberulent at the base and at the mouth within, thickly petaloid, the lobes 4, often reflexed at maturity, narrowly oblong, 1.2–1.7 cm long, puberulent proximally; stamens 4, the anthers exserted, oblong, crescentic, ca. 4 mm long, acute at the apex and base, the abaxial face puberulent, the filaments attached at the mouth, shorter than the corolla lobes, the style filamentous, as long as the corolla tube, the stigmas digitiform or narrowly oblong, ca. 2 mm long. *Fruits* resembling an orange, globose, 4–5(–6.7) cm in diam., maturing yellow, smooth, glabrous, the seeds white to greenish, numerous in a greenish pulp.

The range of *Posoqueria latifolia* is southern Mexico south to Panama; in South America it occurs in Colombia, Venezuela, in the Guianas, in Amazonian Brazil, and in Peru. The pulp of the fruit is edible. Steyermark's maintenance of *P. panamensis*, in view of my examination of over 80 collections in Panama, is untenable. The characters used in keying out *P. panamensis* and *P. latifolia* (Steyermark, 1967, pp. 322–323) overlap to a great degree. Croat (1979) notes that the flowers are pollinated by hawkmoths. "Boca (de) Vieja"; "Borajo"; "Fruta de Mono"; "Huevo de Mono"; "Fruta de Murcielago"; "Mariquito de Marea"; "Monkey Apple"; "Tuli Viejo"; "Sui Tirmas" (*Stier 96*).

BOCAS DEL TORO: Finca 4 (Delta), 10 mi NW of Almirante, *D'Arcy 11203* (MO). Changuinola River, *Lewis et al. 884* (F, GH, K, MO, NY, PMA, UC). Chiriquicito, *Lewis et al. 2048* (MO). Nances Cay Island, *Wedel 579* (MO). Water Valley, *Wedel 997* (MO). Chiriquí Lagoon, *Wedel 1187* (MO). Water Valley, *Wedel 1614* (MO). Chiriquí Lagoon, *Wedel 2379* (MO). CANAL ZONE: Chiva-Chiva Trail, *Allen 955* (MO). Fort Sherman, *Blum 1499* (MO). Summit Garden, *Croat 13134, 16559* (both MO). Fort Kobbe, *Duke 4258* (MO). Fort Sherman, *Duke 9245* (MO). Farfan Beach, *Duke 11734* (MO). Coco Solo, *Dwyer & Duke 7920A* (MO). Albrook Air Force Base, *Hayden 63* (MO). Devil's Beach near Limon Bay, *Johnston 1565* (MO). Fort Sherman, *Johnston 1684* (MO). Trail along Río Petitpie; road to Fort Sherman from Gatún Locks, *Mori & Kallunki 2699* (MO). Howard Air Force Base, *Oliver & MacBryde 1888* (GH, MO). Río Cocoli, Road K-9, *Stern et al. 317* (MO). Albrook Air Force Base, *Stimson 5373* (MO). Chiva-Chiva Trail, *Tyson 1337* (MO). Fort Clayton, *Tyson 3470* (MO). BARRO COLORADO ISLAND: *Aviles 7A* (MO); *Croat 6057, 6737, 12633, 15062* (all MO); *Shattuck 302, 1067* (both MO); *Weaver & Foster 1478* (MO). CHIRIQUÍ: 12.4 mi N of Davíd, *Lewis et al. 714* (MO). COCLÉ: El Valle, *Alston & Allen 1861* (MO). La Pintada, *Escobar 9* (MO). COLOŃ: Santa Rita Ridge, *Correa & Dressler 923* (MO). San Miguel de la Borda, *Croat 9882* (MO). Punta Pedro, Icacal, *Howell 38* (MO). Piña, *Lewis et al. 1845* (GH, MO, UC, US). Along Caribbean at Quebrada Santa Marta, 4½ km SW of Piña, *Nee 11695* (MO). DARIÉN: Cerro Pirre, *Bristan 583* (MO). Quebrado Venado and Peje Swamp, *Bristan 1016* (MO). Pico Piraque, *Duke 8142* (MO). Río Balsa, *Duke 8778* (MO). Piñas, *Duke 10594* (MO). Santa Fé, *Duke 14275* (MO). Cañasas and Sábalo, *Duke 14474* (MO). Río Uruseco, 4½ km S of El Real, *Mori & Kallunki 5517* (MO). Santa Fé, *Tyson et al. 4812* (MO). LOS SANTOS: Loma Prieta, *Duke 11839* (MO); *Lewis et al. 2220* (COL, MO, UC, VEN). Macaracas and Quebrada Bejuco, *Tyson et al. 2903* (MO). PANAMÁ: Cerro Campana, *Castillo 21* (MO). El Llano, *Croat 14502* (MO). Cerro Campana, *Croat 14680* (MO). Chepo, *Dodge 10722* (MO). Quebrada La Palma, *Dodge & Allen 17357, 17367* (both MO). Río Pita, *Duke 4763* (MO). Río Teribe, *Duke 5673* (MO). Isla del Rey, near San Miguel, *Duke 10418* (MO). Cermeño, *Dwyer 6631* (MO). Goofy Lake, Cerro Azul, *Dwyer 7129* (MO). Chagres, *Fendler 293* (MO). El Llano, *Gentry & Tyson 1726* (MO). Lídice, *Jaramillo 11* (MO). Chilibre, *Lao & Holdridge 7* (MO). Falls of La Chorrera, *Lewis et al. 5207* (MO, SCZ, UC, VEN). Gorgas Memorial Labs, 5–10 km NE of Altos de Pacora, 600 m, *Mori & Kallunki 3338* (MO). El Llano-Cartí Road, 12 km N of Panamerican Highway, *Nee & Dressler 9382* (MO). El Llano-Cartí Road, *Nee & Dwyer 9236* (MO). Fort San Lorenzo, *Oustgaard 56* (MO). Villa Rosario, *Saldaña 40* (MO). Saboga Island, *Tyson & Loftin 5148* (MO). Isla Taboga, *Woodson*

et al. 1434 (MO). SAN BLAS: Puerto Obaldía, *Croat 16949* (MO). Soskatupu, *Duke 8960* (MO). Isla Piña, near Mulatupo, *Elias 1703* (GH, MO, US). Opposite Achituppu, *Lewis et al. 114* (GH, MO, UC, US). Opposite Ailigandí, *Lewis et al. 192* (GH, K, MO, NY, UC, US). VERAGUAS: Isla de Coiba, *Dwyer 1621, 2393* (both MO). Mouth of Río Concepción, *Lewis et al. 2821* (COL, DUKE, MICH, MO, UC). NW of Santa Fé, 11 km from Escuela Agricola de Piedra, 450–550 m, *Mori & Kallunki 3894* (MO). S of Santa Fé, 450 m, *Nee 8058* (MO). 14 km of Santiago, Bridge Santiago-Santa Fé Highway, *Nee 9919* (MO).

67. PSYCHOTRIA

Psychotria L., Syst. Nat., ed. 10. 929, 1122, 1364. 1759. Nomen conserv. TYPE: *P. asiatica* L.

Psychotrophum P. Br., Civ. Nat. Hist. Jam. 160. 1756. Nomen rejic.
Myristiphyllum P. Br., Civ. Nat. Hist. Jam. 152. 1756. Nomen rejic.
Nonatelia Aubl., Hist. Pl. Guiane 182. 1775. TYPE: *N. officinalis* Aubl.
Mapouria Aubl., Hist. Pl. Guiane 1: 175. 1775. TYPE: *M. guianensis* Aubl.
Ronabea Aubl., Hist. Pl. Guiane 1: 154. 1775. TYPE: *R. latifolia* Aubl.

Subshrubs, shrubs or *trees,* rarely scandent, occasionally epiphytic. *Leaves* rarely sessile, opposite; stipules free or connate, usually caducous. *Inflorescences* usually terminal, often paniculate, occasionally aggregated into heads; bracts usually persistent, occasionally involucrate; bracteoles usually present, often deciduous. *Flowers* mostly small, (4–)5(–8)-merous, bisexual, often heterostylous, the hypanthium small, the calycine cup usually short, occasionally with small glands within, the lobes or teeth absent or present, usually 5; corolla usually white or yellow, the tube short, the lobes valvate in the bud, occasionally galeate; stamens included or exserted, the anthers usually narrowly oblong, the filaments variously inserted in the corolla tube; ovarian disc usually cushion shaped, the style solitary, slender, the stigmas 2(4–5), the ovary 2(4–5)-celled, the septum thick, the ovules 1 per locule, attached basally. *Fruits* fleshy, the flesh usually soon deciduous exposing 2 pyrenes, the endocarp of the pyrene ventrally flat or grooved, dorsally costate or ecostate, the testa thin, the albumen hard, sometimes ruminate.

Psychotria is well distributed throughout the warmer parts of the world. It is the largest genus of the Rubiaceae with about 800 species. It is the largest genus of the family in Panama.

The Panamanian species with few exceptions sort into 2 genera without difficulty. Although from a worldwide viewpoint there is much to support the incorporation of *Cephaelis* into *Psychotria* as was done by Steyermark (1974), I maintain them as separate genera.

The frequent absence of stipules on individual herbarium sheets represents a major difficulty in preparing and using a key. Stipules are of great diagnostic importance in the Rubiaceae as a whole, and are morphologically of greater importance than the style, stigmas, or anther. This is perhaps the reason why Paul Standley, the doyen of students of the Rubiaceae of the New World until his death in 1967, usually gave little attention to the internal parts of the flowers in his descriptions. The differences between many species of *Psychotria* are difficult to put into words. Standley (1940) in describing *P. allenii* summed up the problem: "Like the majority of *Psychotria* species, this one has no outstanding distinctive characters. It is, however, unlike any other known from Central America."

Key to the Psychotria

1. Plants epiphytic; carpels 4.
   2. Leaves to 1.8 cm long, 0.25–0.55 cm wide ---- 53. *P. maxonii*
   2′. Leaves 2–8 cm long, 1–4 cm wide.
      3. Leaves with lateral veins 4–6(–7), often evanescent ---- 64. *P. orchidearum*
      3′. Leaves with lateral veins ca. 10, usually somewhat evident ---- 72. *P. pithecobia*
1′. Plants not epiphytic; carpels 2 or 5.
   4. Carpels 5 ---- 79. *P. racemosa*
   4′. Carpels 2.
      5. Plants with the majority of the following characters: leaves membranous, often with veins drying red; inflorescences oblong, the axes red or purple; corolla lobes partly purple or pink ---- 76. *P. pubescens*
      5′. Plants with leaves papyraceous or coriaceous, occasionally membranaceous, the veins drying green, yellow, red, brown etc.; inflorescences mostly pyramidal or globose in shape, the axes green, yellow, brown, not usually red or purple.
         6. Stipules notched or retuse at the apex.
            7. Plants drying green, brown, gray or yellow, not wine red; leaves membranous to chartaceous.
               8. Stipules wider than long, coriaceous, with soft white hairs interspersed with spike-like glands at the base within ---- 23. *P. copeyana*
               8′. Stipules longer than wide, membranous to chartaceous, glabrous to glabrescent within, without soft white hairs and spike-like glands within.
                  9. Inflorescence branches and cymules giving a zig-zag effect ---- 6. *P. berteriana*
                  9′. Inflorescence branches and cymules not giving a zig-zag effect ---- 49. *P. luxurians*
            7′. Plants usually drying wine red; leaves coriaceous or stiffly chartaceous ---- 18. *P. chiriquina*
         6′. Stipules not notched or retuse at the apex.
            10. Leaves with veins with domatia or pores or minute veil-like structures (often obscured by hairs in *P. nervosa*) in the axils beneath.
               11. Plants densely ferrugineous pubescent; inflorescence emerging from a stiff terminal stipule ---- 59. *P. nervosa*
               11′. Plants glabrous or glabrescent, not densely pubescent; inflorescence not emerging from a stiff terminal stipule.
                  12. Leaves drying red.
                     13. Inflorescences ca. 1 cm long ---- 61. *P. oerestediana*
                     13′. Inflorescences 5–12 cm long ---- 67. *P. panamensis*
                  12′. Leaves drying green, brown, gray, purple or yellow, not drying red.
                     14. Largest leaves more than 6.5 cm long.
                        15. Leaves neither coriaceous nor drying yellow; inflorescences less than 5 cm wide (*P. marginata* and occasionally *P. granadensis* excepted).
                           16. Leaves drying metallic gray or purplish brown or purple; inflorescences 10–16 cm wide ---- 52. *P. marginata*
                           16′. Leaves drying green or brown; inflorescences 3–5 cm wide.
                              17. Inflorescences spike-like, the branches bearing tight flower clusters ---- 3. *P. alboviridula*
                              17′. Inflorescences paniculate, the flowers or flower clusters spreading.
                                 18. Inflorescence to 4 cm long; peduncle not terminated by 5 radiate branches ---- 38. *P. granadensis*
                                 18′. Inflorescences 5–15 cm long; peduncle often terminated by 5 radiate branches ---- 42. *P. horizontalis*
                        15′. Leaves coriaceous, drying a lemon yellow; inflorescences 5–8 cm wide ---- 33. *P. fendleri*
                     14′. Largest leaves less than 6.5 cm long.
                        19. Leaves thinly coriaceous, 1–2 cm wide; stipules obtuse, without awns ---- 46. *P. liesneri*
                        19′. Leaves chartaceous, 2–3.5 cm wide; stipules with 1–2 awns ---- 95. *P. vallensis*
10′. Leaves without domatia in the axils of the lateral veins.
   20. Leaves callose marginate.
      21. Leaves 14–19 cm long; inflorescence paniculate.
         22. Trees to 10 m tall; twiglets 4-angled; leaves with lateral veins 9–10; inflorescences ca. 10 cm long ---- 78. *P. quadrangulata*
         22′. Trees to 4 m tall; twiglets subterete; leaves with lateral veins ca. 14; inflorescence to 20 cm long ---- 20. *P. cincta*

21′. Leaves 3–9 cm long.
23. Inflorescences racemiform, the branches distichous; trees to 5 m ---- 65. *P. oresbia*
23′. Inflorescences paniculate, the branches not distichous; trees to 2 m ---- 81. *P. sanfelicensis*
20′. Leaves with the margin thin, the blade not callose marginate.
24. Inflorescences with axes spike-like, the flowers disposed in well spaced glomerules.
25. Inflorescences shorter than the terminal leaves; peduncle 2–3 cm long ---- 97. *P. viridis*
25′. Inflorescences longer than the terminal leaves; peduncles 5–7.5 cm long ---- 3. *P. alboviridula*
24′. Inflorescences paniculate, racemose, the flowers spreading, not disposed in well spaced, small glomerules.
26. Leaves obviously bullate above ---- 41. *P. hammelii*
26′. Leaves smooth, not bullate above.
27. Leaves fleshy, to 1.5 cm wide, the lateral veins ca. 4 ---- 68. *P. parvifolia*
27′. Leaves chartaceous, membranous, rarely coriaceous, more than 1.5 cm wide, the lateral veins 6–30.
28. Leaf-blades rigid, crisp, the lateral veins drying white beneath; inflorescence china white ---- 12. *P. capitata*
28′. Leaf blades relatively soft, not stiff, the lateral veins drying green, brown, pink, rarely white beneath; inflorescences green, red, yellow, not china white.
29. Twiglets ultimately 4-angled.
30. Stipules decidous; leaves with lateral veins 9–10, drying pink beneath ---- 78. *P. quadrangulata*
30′. Stipules persistent; leaves with lateral veins 12–15, drying brown or green beneath ---- 39. *P. grandis*
29′. Twiglets not strongly 4-angled, often terete.
31. Flowers precocious, appearing before the leaves ---- 43. *P. impatiens*
31′. Flowers appearing after the leaves.
32. Leaves drying white or silver or purple beneath.
33. Inflorescence branches with zig-zag appearance ---- 86. *P. solitudinum*
33′. Inflorescence branches strict, not having a zig-zag appearance.
34. Leaves drying purple beneath.
35. Inflorescence golden pubescent; leaf blades ca. 10 cm wide; stipules scarious marginate ---- 83. *P. santa-rosae*
35′. Inflorescence not golden pubescent; leaf blades 2–6(–6.8) cm wide; stipules not scarious marginate.
36. Inflorescence shorter than the terminal leaves ---- 73. *P. pittieri* subsp. *oinochrophylla*
36′. Inflorescence much longer than the terminal leaves ---- 52. *P. marginata*
34′. Leaves drying white or silver beneath.
37. Calyx cup spathaceous ---- 7. *P. boquetensis*
37′. Calyx cup not spathaceous.
38. Leaves consistently rounded at apex; blades with 30–35 lateral veins ---- 74. *P. polyphlebia*
38′. Leaves acute, obtuse or deltoid at apex; blades with lateral veins less than 30.
39. Fruits turbinate; stipules 1–1.2 cm long, the margins scarious ---- 21. *P. cooperi*
39′. Fruits rounded or obtuse at the apex; stipules 0.2–0.9 cm long, the margins regular.
40. Corolla tube elongate, 8–30 mm long.
41. Fruits oblong, 1.5–2 cm long; corolla tube 15–30 mm long ---- 17. *P. chiapensis*
41′. Fruits oblong rotund, to 1 cm long; corolla tube to 13 mm long ---- 66. *P. ostaurea*
40′. Corolla tube short, 3–5 mm long.
42. Leaves glabrous beneath.
43. Leaves 2.5–8.5 cm long, the lateral veins 12–14; stipules ca. 0.2 cm long ---- 36. *P. goldmanii*
43′. Leaves 9–12 cm long, the lateral veins ca. 10; stipules ca. 1.5 cm long ---- 96. *P. veraguensis*
42′. Leaves puberulent to densely pubescent beneath.
44. Leaves densely white pubescent beneath ---- 73. *P. pittieri*
44′. Leaves puberulent beneath, but not densely so; occasionally glabrescent.

45. Inflorescences ca. 15 cm wide; calyx lobes longer than the calyx cup ---- 23. *P. copeyana*
45′. Inflorescences 2–8 cm wide; calyx lobes shorter than the calyx cup ---- 96. *P. veraguensis*
32′. Leaves drying green or brown, not white or silvery white beneath.
46. Leaves opposite but appearing verticillate at the branch tips, sessile, auriculate, drying a deep red; herbs ---- 80. *P. rosulatifolia*
46′. Leaves opposite but well spaced at the branch tips, not verticillate, petiolate, acute to obtuse at the base; subshrubs, shrubs or trees.
47. Calyx cup with conspicuous glandular markings outside; stipules with 4 pad like cushions of hairs within ---- 25. *P. davidsei*
47′. Calyx cup eglandular outside; stipules glabrous within, without cushions of hairs.
48. Inflorescences with the lowermost bracts foliaceous and involucrate.
49. Bracts drying red; leaves usually flushed with red beneath ---- 87. *P. suerrensis*
49′. Bracts drying white or yellow; leaves drying green or brown beneath ---- 19. *P. chloritica*
48′. Inflorescence with lowermost bracts, if present, subulate or narrowly oblong, not foliaceous, well spaced and not involucrate.
50. Carpels 4; leaves fleshy; plants epiphytic.
51. Leaves 2–8 cm long; plants not ericoid.
52. Leaves with lateral veins 4–6(–7), often evanescent ---- 64. *P. orchidearum*
52′. Leaves with lateral veins ca. 10, usually somewhat evident ---- 72. *P. pithecobia*
51′. Leaves to 1.8 cm long; plants ericoid ---- 53. *P. maxonii*
50′. Carpels 2 or 5; leaves membranous to chartaceous; plants terrestrial.
53. Carpels 5 ---- 79. *P. racemosa*
53′. Carpels 2.
54. Leaves cordate at the base.
55. Leaves with lateral veins 17–20; peduncle ferrugineous-hirsute ---- 45. *P. insignis*
55′. Leaves with lateral veins 5–10; peduncle glabrous to white pubescent ---- 42. *P. horizontalis* subsp. *basicordata*
54′. Leaves acute to obtuse at base, not cordate.
56. Inflorescence racemose, the branches distichous ---- 65. *P. oresbia*
56′. Inflorescence paniculate.
57. Herbs to 0.5 m tall; leaves with lateral veins 30–35 ---- 80. *P. rosulatifolia*
57′. Trees, shrubs or subshrubs; leaves with lateral veins less than 30.
58. Fruits obviously didymous.
59. Leaves lustrous above, the acumen 1–2 cm long; fruits rounded, buttocks-like ---- 1. *P. acuminata*
59′. Leaves dull above, the acumen scarcely measurable; fruits rounded but not buttocks-like ---- 13. *P. carnosocarpa*
58′. Fruits not obviously didymous.
60. Inflorescence obviously terminal.
61. Leaves ovate, oval or oblong rotund.
62. Leaves with lateral veins 7–12.
63. Leaves coriaceous, the lateral veins not pellucid red when exposed to light ---- 92. *P. tutensis*
63′. Leaves chartaceous, the lateral veins pellucid red when exposed to light ---- 24. *P. croceovenosa*
62′. Leaves with lateral veins 14–20.
64. Stipules conspicuously scarious marginate, the margin drying much lighter than the body ---- 71. *P. pilosa*
64′. Stipules more or less uniform in texture, the margin not scarious marginate.
65. Largest leaves to 13 cm long; plants densely golden pubescent, drying a molasses tan ---- 89. *P. tacarcunensis*
65′. Largest leaves to 25 cm long, white to ferrugineous pubescent, drying red, green or brown, not drying a molasses tan.
66. Leaves ferrugineous pubescent beneath; inflorescence mostly sessile ---- 10. *P. calophylla*
66′. Leaves white puberulent beneath; inflorescence pedunculate ---- 51. *P. magna*

61′. Leaves elliptic or oblong, not ovate, oval or oblong rotund.
67. Stipules obviously scarious marginate, the margin drying lighter than body ---- 71. *P. pilosa*
67′. Stipules not scarious marginate.
68. Leaves thick, coriaceous; fruits ca. 2 cm long ---- 63. *P. olgae*
68′. Leaves thin, membranous or chartaceous, rarely thinly coriaceous; fruit 0.25–1.5 cm long.
69. Leaves drying yellow, at least below.
70. Leaves chartaceous or membranous.
71. Leaves with lateral veins 9–10, glabrous or glabrescent beneath; inflorescences with the rachis green.
72. Leaves 2.5–6 cm long; inflorescences ca. 8 cm long ---- 81. *P. sanfelicensis*
72′. Leaves 7–15(–22) cm long; inflorescences to 2 cm long ---- 8. *P. brachybotrya*
71′. Leaves with lateral veins 9–18, puberulent beneath; inflorescences with rachis purple ---- 76. *P. pubescens*
70′. Leaves stiffly papyraceous to subcoriaceous.
73. Stipules less than 1 cm long.
74. Subshrubs to 1 m tall; leaves drying lemon yellow beneath ---- 33. *P. fendleri*
74′. Trees; leaves drying dirty yellow or greenish yellow beneath.
75. Trees to 7 m tall; leaves with lateral veins 9–10; stipules ca. 0.2 cm long, without lobes; fruits ca. 1.5 cm long, pyrenes blue ---- 44. *P. indigotica*
75′. Trees to 20 m tall; leaves with lateral veins 11–13; stipules ca. 5 mm long, the awns 2; fruits to 0.9 cm long; pyrenes variously colored, not blue ---- 82. *P. santaritensis*
73′. Stipules more than 1 cm long.
69′. Leaves drying green, brown, red, gray but not yellow beneath.
76. Leaves small, 1–9 cm long.
77. Leaves 1.5–3.5 cm wide.
78. Inflorescences umbelliform.
79. Leaves with lateral veins ca. 7, the submarginal vein inconspicuous, obviously acuminate ---- 70. *P. philacra*
79′. Leaves with lateral veins 9–14, the submarginal vein conspicuous, vaguely acuminate ---- 88. *P. sylvivaga*
78′. Inflorescences with branches not disposed umbellately.
80. Leaves long acuminate, the acumen 1.5–2 cm long.
81. Leaves with lateral veins ca. 15; calyx teeth to 1.7 mm long ---- 23. *P. copeyana*
81′. Leaves with lateral veins ca. 10; calyx teeth ca. 4 mm long ---- 32. *P. eugenifolia*
80′. Leaves scarcely acuminate, the acumen less than 1 cm long.
82. Leaves drying red, the lateral veins strict, not wavy or corrugated when dry; calyx teeth ca. 0.5 mm long ---- 5. *P. bakeri*
82′. Leaves drying gray or reddish gray, brown or green, the lateral veins wavy or wrinkled when dry; calyx with teeth 2–3.5 mm long ---- 16. *P. chagrensis*
77′. Leaves 3.5–5.5 cm wide.
83. Leaves with lateral veins 5–7; plants drying green, brown, black, not red.
84. Stipules free.
85. Branchlets perpendicular to twigs (Panama); calycine cup without glands within; corolla tube ca. 8 mm long ---- 55. *P. microdon*
85′. Branchlets ascending; calycine cup with glands within; corolla tube ca. 3 mm long.
86. Inflorescences ca. 3 mm long, shorter than the terminal leaves, the peduncle capillaceous, ca. 0.35 mm wide ---- 37. *P. graciliflora*

86′. Inflorescences 8–15 cm long, usually longer than the terminal leaves, the peduncle slender, ca. 0.85 mm wide.
84′. Stipules connate.
87. Leaves chartaceous; stipules 3–9 mm long; inflorescences 8–15 cm long, the branches zig-zag ---- 26. *P. deflexa*
87′. Leaves membranous; stipules ca. 3.5 mm long; inflorescences to 2 cm long, the branches strict, not zig-zag ---- 35. *P. furcata*
83′. Leaves with lateral veins (7–)8–20; plants drying red.
88. Leaves ferrugineous villosulose or ferrugineous-pubescent beneath ---- 59. *P. nervosa*
88′. Leaves glabrous or pubescent, the pubescence white or golden.
89. Leaves chartaceous; inflorescences with lowermost bracts deciduous or inconspicuous.
90. Flowers drying a brilliant red ---- 84. *P. siccorubra*
90′. Flowers drying black, brown, green, yellow, if red a dull red.
91. Largest leaves ca. 1.5 cm long ---- 68. *P. parvifolia*
91′. Largest leaves ca. 3 cm long.
92. Leaves with lateral veins (7–)8–10, often with domatia in the axils; stipules ca. 8 mm long ---- 95. *P. vallensis*
92′. Leaves with lateral veins ca. 8, without domatia in the axils; stipules ca. 4 mm long ---- 34. *P. fruticetorum*
89′. Leaves coriaceous; inflorescences with lowermost bracts more than 3 mm long ---- 18. *P. chiriquina*
76′. Leaves large, 9–40 cm long.
93. Inflorescence axis sinuous and elongate, to 45 cm long ---- 56. *P. mima*
93′. Inflorescence axis rigid, less than 20 cm long.
94. Inflorescences with the branches umbellately disposed, appearing as an erect trident; fruits ca. 1.8 cm long ---- 94. *P. umbelliformis*
94′. Inflorescences with branches opposite, alternate or radiate along the axis, not umbellate; fruits less than 1 cm long (except P. *allenii* 1–2 cm long).
95. Calyx with cup saucer shaped, truncate, without well-defined teeth; trees 4–6 m tall; leaves with lateral veins 6–8 (occasionally 9 in *P. allenii*).
96. Leaves beneath puberulent on costa and veins, coriaceous; ovarian disc with conspicuous ring at apex ---- 29. *P. durilancifolia*
96′. Leaves beneath glabrous, chartaceous to thinly coriaceous; ovarian disc without conspicuous ring at apex.
97. Fruits ca. 4 mm long; petioles ca. 2.5 cm long ---- 15. *P. catillicalyx*
97′. Fruits ca. 15 mm long; petioles 1–2 cm long ---- 4. *P. allenii*
95′. Calyx with cup cylindrical, toothed; shrubs, rarely trees; leaves usually with lateral veins more than 8.
98. Inflorescences ca. 1 cm long; leaves usually drying a dull red beneath -- 75. *P. psychotriaefolia*
98′. Inflorescences more than 2 cm long; leaves green or brown beneath, not drying red.
99. Stipules connate.
100. Stipules to 0.5 cm long, not scarious marginate ---- 35. *P. furcata*
100′. Stipules 2–3 cm long, strongly scarious marginate ---- 71. *P. pilosa*
99′. Stipules free.
101. Leaves with lateral veins drying white beneath, the submarginal vein well set in from the margin; inflorescences to 1.5 cm long; fruits drying orange ---- 40. *P. haematocarpa*

101′. Leaves with lateral veins drying green, yellow, brown, or red, not white, the submarginal vein proximate to margin; inflorescences 2–15 cm long; fruits drying various colors, not orange.
102. Leaves with lateral veins 18–26.
103. Inflorescences longer than wide; peduncle 4–6.5 cm long; leaves pubescent beneath.
104. Subshrubs to shrubs, 1–2 m tall; stipules lobed at base ---------- 22. *P. copensis*
104′. Shrubs to trees, 3–6 m tall; stipules not lobed at base.
105. Inflorescences with basal branches radiate, the lowermost bracts to 0.5 cm long; hypanthium densely villose ---------- 54. *P. micrantha*
105′. Inflorescences with basal branches opposite, the lowermost bracts to 1.5 cm long; hypanthium glabrous to glabrescent ---------- 58. *P. mortoniana*
103′. Inflorescences wider than long; peduncle 1.5–2 cm long; leaves glabrous beneath ---------- 47. *P. limonensis*
102′. Leaves with lateral veins (5–)7–17.
106. Inflorescences with primary branches radiate.
107. Shrubs to 3 m tall; leaves 2–5 cm wide, tapering narrowly into a distinct petiole ---------- 14. *P. carthaginensis*
107′. Trees 5–8 m tall; leaves more than 5 cm wide, the blade not tapering basally.
108. Trees ca. 8 m tall; leaves with lateral veins ca. 12, obviously petiolate; calyx with teeth to 0.5 mm long ---------- 90. *P. taurina*
108′. Trees ca. 5 m tall, the leaves with lateral veins 5–10, scarcely petiolate; calyx with lobes 1–2.5 mm long ---------- 42. *P. horizontalis*
106′. Inflorescences with primary branches opposite, not radiate.
109. Inflorescences to 6.5 cm long.
110. Fruits 2–2.5 mm long; leaves with lateral veins 15–20 ------ 77. *P. pumiliocarpa*
110′. Fruits 3–7(–12) mm long; leaves with lateral veins 6–11(–12).
111. Bracts subtending lowermost inflorescence branches elongate, (0.4–)0.6–1.3 cm long; fruits 0.3–0.7 cm long.
112. Peduncle absent or to 1.2 cm long; bracts subtending lowermost branches of inflorescences oblong, to 0.8 cm long ---------- 8. *P. brachybotrya*
112′. Peduncle 1.5–3.2(–5) cm long; bracts subtending lowermost branches of inflorescences subulate, 0.4–1.3 cm long ---------- 62. *P. officinalis*
111′. Bracts subtending lowermost inflorescence branches short, less than 0.5 cm long; fruits 0.6–1.2 cm long ---------- 91. *P. trichotoma*
109′. Inflorescences 7–22 cm long.
113. Inflorescence branches bearing flowers or flower clusters in a spike-like fashion ---------- 3. *P. alboviridula*
113′. Inflorescences with flowers not disposed in spikes.
114. Inflorescences pyramidal or oblong, not as wide as long; calyx teeth to 1 mm.
115. Leaves chartaceous.
116. Flowers few, aggregated into compressed but non-involucrate heads; largest bracts stiff, not reflexed, paralleling branches of inflorescence; fruits china blue ---------- 9. *P. brachiata*
116′. Flowers many, in well-spaced cymes; largest bracts reflexed and not paralleling branches of inflorescence; fruits variously colored, not china blue ---------- 49. *P. luxurians*

115′. Leaves coriaceous or subcoriaceous.
117. Leaves drying green, basally cuneate, the lateral veins drying white beneath ---- 12. *P. capitata*
117′. Leaves drying reddish brown, basally attenuate acute, the lateral veins not drying conspicuous white beneath ---- 29. *P. durilancifolia*
114′. Inflorescences widely paniculate.
118. Inflorescences as wide as long; calyx with teeth 1–1.7 mm long, regular; stipules smooth externally ---- 23. *P. copeyana*
118′. Inflorescence not as wide as long; calyx with teeth less than 1 mm long, irregular; stipules glandular punctate outside ---- 60. *P. nubiphila*

60′. Inflorescences axillary.
119. Inflorescences with peduncles 14–45 cm long.
120. Leaves to 9 cm long; peduncles 20–45 cm long ---- 48. *P. longipedunculata*
120′. Leaves 10–30 cm long; peduncle to 20 cm long.
121. Stems golden pubescent; corolla tube glabrous, the lobes with a rotund mass of hairs adaxially; plants ca. 1 m tall ---- 11. *P. capacifolia*
121′. Stems glabrous; corolla tube puberulent, the lobes glabrous within; plants ca. 0.5 m tall ---- 69. *P. perparva*
119′. Inflorescences with peduncles less than 14 cm long or absent.
122. Stipules with marginal fimbriae.
123. Leaves with lateral veins 10–17; calycine teeth 5.
124. Fruits smooth, round, resembling a rubber ball; ovarian disc about as long as the calyx; subshrubs to shrubs (1–)1.5–2 m tall ---- 85. *P. siggersiana*
124′. Fruits costate, oblong; ovarian disc shorter than the calyx; subshrubs to 1½ m tall ---- 28. *P. dukei*
123′. Leaves with lateral veins ca. 25; calycine teeth usually 6 ---- 98. *P. wilburiana*
122′. Stipules more or less entire, without marginal fimbriae.
125. Leaves succulent.
126. Stipules connate, collar shaped, truncate, without teeth or lobes ---- 57. *P. morii*
126′. Stipules free, not collar shaped, acute, rounded or with 2 awns at the apex.
127. Leaves drying tan beneath.
128. Leaves with lateral veins ca. 12, glabrous; fruits cherry red ---- 93. *P. uliginosa*
128′. Leaves with lateral veins ca. 20, densely golden puberulent; fruit color unknown, drying golden color ---- 27. *P. dosbocensis*
127′. Leaves drying green, gray, brown, red but not tan beneath.
129. Calyx with teeth 0.6–2 mm long; fruit drying colored, not white.
130. Subshrubs to 1 m tall; leaves to 5 cm wide; peduncle absent or to 3 cm long; calyx with teeth 0.6–1 mm long ---- 2. *P. aggregata*
130′. Herbs ca. 0.25 cm tall; leaves to 18 cm wide; peduncle ca. 16 cm long; calyx with teeth 1.2–2 mm long ---- 69. *P. perparva*
129′. Calyx with teeth absent or to 0.4 mm; fruits white ---- 50. *P. macrophylla*
125′. Leaves chartaceous to thinly coriaceous.
131. Inflorescences with flowers densely congested into 1–3 heads; largest leaves 15–25 cm long.
132. Leaves ca. 25 cm long; inflorescences sessile or subsessile; fruits oblong ---- 99. *P. xerococcoides*
132′. Leaves to 12.5 cm long; inflorescences shortly pedunculate; fruits turbinate ---- 21. *P. cooperi*
131′. Inflorescences with flowers spreading, not congested into 1–3 heads; largest leaves to 15 cm long.
133. Leaves 9–15 cm long, thinly coriaceous, attenuate or obtuse basally, the lateral veins 7–10; pyrenes not twisted ---- 31. *P. erecta*
133′. Leaves 5.5–15 cm long, mostly more than 10 cm long, chartaceous, attenuate basally, the lateral veins 7–11; pyrenes twisted ---- 30. *P. emetica*

1. **Psychotria acuminata** Benth., Bot. Voy. Sulphur 107. 1845. TYPE: Isle of Gorgona and Colombian Coast. Not seen.

1a. **Psychotria acuminata** ssp. **acuminata.**

Shrubs to 3 m tall, the branchlets terete, smooth, glabrate, rimose, ultimately angular; nodes well spaced; pith white. *Leaves* widely oblong or lanceolate, 6–18 cm long, 2.5–8.5 cm wide, deltoid to acute apically, long acuminate, the acumen to 2 cm long, acute, often falcate, basally obtuse to cuneate, occasionally inequilateral; the costa prominulous above, prominulous to prominent beneath, the lateral veins 11–12, strict then arcuate, usually with 1–2 smaller and soon evanescent veins between 2 lateral veins, the tertiary veins irregular pinnatiform, the intervenal areas spreading reticulate, chartaceous, usually concolorous, drying lustrous green above, glabrous or occasionally villosulose on the costa and veins beneath; petioles 1.2–2.0 cm long, glabrous; stipules connate, cupuliform, usually ca. 3 mm long, often ciliate, truncate and with 2 erect awns, scarcely longer or almost twice as long as the body, puberulent. *Inflorescences* shorter than terminal leaves, terminal or pseudo terminal, paniculate, often subhemispherical or oblong, 1.0–6.5 cm long, 0.8–2.0 cm wide, puberulent; peduncles to 3.5 cm long, 0.7–1.0 mm wide, the lowermost branches opposite or alternate, the upper branches few, opposite or alternate; bracts minute, the bracteoles absent. *Flowers* 4–5-merous, the hypanthium short, cupuliform, to 0.5 mm long, somewhat truncate or with minute irregular teeth, puberulent; corolla white, green or yellow, the tube cylindrical, to 6 mm long, glabrous outside with a few hairs below the filament attachment within, the lobes 4–5, oblong or ovate, to 2.5 mm long, glabrous or minutely puberulent outside; stamens 4–5, included in long-styled flowers, the anthers narrowly oblong, ca. 1 mm long, the filaments attached near the middle of the tube; styles long or short, the long styles to 7 mm long, exserted 2–3 mm; ovarian disc bilobed, to 0.5 mm deep, the stigmas 1.0–1.8 mm long. *Fruits* usually didymous, the pyrenes 2, rarely 5, 4 in epiphytic species, rounded, 5–7 mm in diam., glabrous, the ventral face of the endocarp with a groove, the dorsal surface ribless, yellow, turning gray blue at maturity.

This well-collected species ranges from Mexico south to Peru. The Panamanian material has long been misidentified as *Psychotria cuspidata* Bredemeyer ex Romer & Schultes, a species confined to Venezuela (cf. Steyermark, 1972). *Croat 15077* notes that the stamens may extend 3 mm above the throat and *Croat 14981* notes that the stamens are in a row on one side of the corolla.

CANAL ZONE: Without other locality, *Blum 569* (MO). Albrook, *Dwyer 6708* (MO, US), *6747* (MO). Las Cruces Trail, *Dwyer & Hayden 5* (MO). Pipeline Road, *Gentry 1947* (MO). Pavon Road, NW part of Canal Zone, *Johnston 1627* (MO). Pipeline Road, N of Gamboa, *Luteyn & Foster 1526* (MO, US). Howard Air Force Base, *Oliver & Macbryde 1895* (GH, MO, UC, US). Navy Pipeline Reserve Area, ca. 3 mi NW of Gamboa, *Stimson 5342* (MO, NY). 2 mi N of Cocoli, *Tyson 1638* (MO). Fort Sherman, *Tyson 1709* (MO); *Tyson & Blum 1668* (MO). Fort Clayton, *Tyson 1802* (US). BARRO COLORADO ISLAND: *Aviles 46* (MO); *Croat 4092, 4525, 4607, 4891, 5195A, 5877, 6112, 6181, 6217, 6549, 6773, 7301, 8020, 9542, 11179, 11788, 14981, 15077* (all MO); *Ebinger 4* (MO); *Hayden 5, 24, 53, 134, 148, 149* (all MO); *Kennedy 1846* (MO); *Killip 39958* (MO); *Knight 69-25* (MO); *Welsh 19831* (MO); *Woodworth & Vestal 423* (MO). COLÓN: Río Piedras, on road to Portobelo, *Blum et al. 2520* (MO). Achiote, *Tyson et al. 4512* (MO). DARIÉN: La Boca de Pirre, *Bristan 1270* (MO). Río Tucuti, *Duke 5256* (MO). Between Río Balsa and Río Aretí, peak 300 ft high, *Duke 8740* (MO). Cativo Swamp near Tusijuanda, up Río Balsa, *Duke 13526* (MO). Piria-Cañasas Trail near Piria, 100 m, *Duke*

14316 (MO). Cuasi-Cana Trail on Cerro Campamiento, E of Tres Bocas, *Kirkbride & Duke 1225* (MO). Río Tuquesa at mining camp, "Charco Chiva," *Mori 6946* (MO). Campamento Buena Vista, Rio Chucunaque, above confluence with Río Tuquesa, *Stern et al. 862* (MO). Cana-Cuasi Trail (Camp 2), Chepigana, *Terry & Terry 1488* (MO). Periaque Camp at River, *Tyson et al. 4745* (MO). HERRERA: 12.5 mi S of Ocú, 1200 ft, *Lewis et al. 1629* (GH, MO, US). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2192* (MO, UC, VEN). PANAMÁ: Nuevo Emperador, *Baker 16* (MO). Cerro Jefe, *Croat 14440* (MO). 6 mi E of Chepo, Panamerican Highway, *Duke 4087* (MO). Río Pita, 1–3 mi above Río Maestra, *Duke 4745, 4768* (both MO). Near confluence of Río Pacora and Río Corso, ca. 450 m, *Duke 11964* (MO). Fort San Lorenzo, *Hayden 109* (MO). Cerro Campana, *Kirkbride & Hayden 309* (MO). Altos del Río Pacora, *Lewis et al. 2344* (MO, UC). 5–10 km NE of Altos de Pacora, *Mori & Kallunki 6055* (MO). El Llano-Carti Road, 11–12 km from Interamerican Highway, 300–400 m, *Mori et al. 6893* (MO). Ríos Pacora and Corso, *Oliver 2376* (MO, UC, VEN). Cerro Azul to Cerro Jefe, ca. 2000 ft, *Tyson et al. 4317* (MO). Near Arraijan, *Woodson et al. 773, 1346* (both MO). VERAGUAS: Isla de Coiba, *Dwyer 2381* (MO). 5 mi NW of Santa Fé, on Caribbean slope above Río Primero Brazo, 700–1200 m, *Liesner 830* (MO). 5 mi W of Santa Fé, road past Escuela Agricola Alto Piedra, on Pacific side, 800–1200 m, *Liesner 882* (MO).

1b. **Psychotria acuminata** ssp. **boraginoides** Dwyer.[84] TYPE: Panama, *Liesner 1187* (MO).

Psychotria acuminata subsp. *boraginoides* is known only from Panama and Colombia (Choco). It is easily recognized by the reflexed branches of the inflorescences which are curved and have the flowers secundly disposed.

PANAMÁ: El Llano-Cartí Road, 19 mi N of El Llano, 500 m, *Busey 897* (MO). 2.4 mi beyond Cerro Jefe toward Altos de Pacora, 800–1000 m, *Croat 22660* (MO). Campo Tres, 3 mi NE of Alto de Pacora, *Croat 22692* (MO). 20 km above Panamerican Highway, El Llano to Cartí, 200–400 m, *Kennedy 2567* (MO). Campo Tres, 3 mi NE of Altos de Pacora, *Liesner 526* (MO). 12 mi above Panamerican Highway, *Liesner 1187* (MO). 5 mi NE of Altos de Pacora, *Mori & Kallunki 6055* (MO).

2. **Psychotria aggregata** Standley, Contr. U.S. Natl. Herb. 18: 128. 1916. TYPE: Panama, *Pittier 3264* (US, holotype).

Fleshy *shrubs* to 1 m tall, the stem round, the branchlets angular, puberulent, longitudinally striate. *Leaves* oblong or oblanceolate, 12–20 cm long, 3–5 cm wide, deltoid at the apex, often vaguely contracted, the acumen to 0.5 cm long, acute to attenuate acute at the base, often oblique, the costa prominulous above, prominent beneath, to 0.18 cm wide proximally, the lateral veins 10–16, arcuate, usually with one subparallel vein between a pair of lateral veins, thinly coriaceous to papyraceous, puberulent, often farinose (deciduous hair bases?); petioles to 3 cm long, longitudinally striate; stipules connate, apparently persisting only at the apex of the stem or branchlets, presumably oblong rotund, to 1 cm long or longer with 2 divergent triangular lobes shorter than the body of the stipule and the base of the body with a shallow auricle on each side, crassate, glabrous. *Inflorescences* axillary, paniculate, subsessile or on peduncles to 3 cm long, the flowers aggregated into few-flowered heads, these borne on short branches or subsessile; bracts at the base of the branches subulate, shorter or longer than the branches; floral bracts and bracteoles narrowly ovate or oblong. *Flowers* sessile or subsessile; hypanthium ca. 0.7 mm long, pubescent, the calycine cup 1.2 mm long, petaloid,

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[84] *Psychotria acuminata* ssp. *boraginoides* Dwyer spec. nov. Differt a *P. acuminata* ssp. *acuminata* ramis inflorescentiae primo simplicibus, 5–10 mm longis, tunc dichotome ramificantibus cymulis sessilibus 1–3-floriferis floribus in eminentiis minutis secundis 1–3 mm distantibus dispositis.

pubescent, eglandular within, the raphides numerous, the teeth 5, somewhat unequal, subulate or narrowly oblong, 0.6–1.0 mm long; corolla white, the tube cylindrical, to 2.5 mm long, petaloid, pubescent outside, ?glabrous within, the lobes 5, in bud spreading, galeate, the anthers fitting in snugly, the hood solid, at anthesis the lobes elongating, the galeate area pulling away from the anthers with much of the lobe plane; stamens 5, the anthers oblong, ca. 1 mm long, obtuse, the filaments short; ovarian disc ca. 0.6 mm long, the style slender, ca. 2 mm long, the stigmas 2, slightly wider than the style. *Fruits* (immature?) sessile, oblong, ca. 5 mm long, 3.5–4.5 mm wide, white, glabrous, the raphides numerous, the persistent calyx to 2 mm long, the teeth evident.

Psychotria aggregata is known only from Panama. The stipules are quite variable in shape. The galeate tips of the corolla lobes are diagnostic. *Dwyer & Hayden 722* notes that the leaves are "velvety green."

BOCAS DEL TORO: Chiriquí Trail near Chiriquí border, *Kirkbride & Duke 995* (GH, MO, US). CHIRIQUÍ: Boquete, Cerro Horqueta, 5000 ft, *Dwyer & Hayden 722* (MO). Chiriquí Trail between Pinola and David, *Kirkbride & Duke 859* (MO). Cerro Pando, Panama-Costa Rica border, 16 km NW of El Hato de Volćan, 2000–2480 m, *Mori & Bolten 7274* (MO). N of San Félix at Chiriquí-Bocas del Toro border, road to Cerro Colorado copper mine, 5000–5500 ft, *Mori & Kallunki 5387, 5941, 5953* (all MO). Alto de Las Palmas, Cerro Horqueta, *Pittier 3264* (US). Bajo Chorro, *Skog & D'Arcy 4092* (US). COCLÉ: Cerro Pilon, *Croat 14352* (MO); *Dwyer & Lallathin 8957* (MO). Cerro Gaital Caracoral, *Dwyer & Correa 8977* (MO). PANAMÁ: Road to Altos de Pacora, vicinity of schoolhouse, *Mori & Kallunki 2366* (MO).

3. **Psychotria alboviridula** Krause, Notizbl. Königl. Bot. Gard. Berlin 6: 208. 1914. TYPE: Brazil, *Ule 9846*. Not seen.

Shrubs or *trees* to 7 m tall, the branchlets terete, smooth, glabrate, drying red or black, the nodes well spaced. *Leaves* oblong or lanceolate, 7.5–25.0 cm long, 2.5–8.5 cm wide, often distinctly inequilateral, tapering obtusely or deltoidly at the apex, acuminate, the acumen to 1.8 cm long, often falcate, cuneate or attenuate acute, often slightly inequilateral at the base, the costa prominulous above, often grooved, prominent beneath, to 3 mm wide proximally, often the lower ½ of the blade with solitary domatia in the vein axils, these to 6 mm long, the pore 1–3 mm wide, the lateral veins 7–12, arcuate, often subrigid, subcoriaceous to papyraceous, often drying red brown, especially younger leaves, glabrous; petioles to 2 cm long, 1.5–2.2 mm wide; stipules caducous, triangular or ovate, 4–8 mm long, acute, glabrous, except setose within. *Inflorescences* terminal, solitary, at the end of short branches or axillary, paniculate, glabrous, 15–20 cm long, the peduncle 5.0–7.5 cm long, flattened, the branches few, the flowers few, borne in spikelike fashion, spreading or strict, well spaced, often deflexed, opposite and monostichous above, the lowermost 3–4 often verticillate, tumid above junction with rachis; bracts ovate or triangular, to 2.5 mm long, acute. *Flowers* drying red; hypanthium short, 0.8 mm long, the calycine cup 0.3–0.5 mm long, turgid, eglandulose within or with minute red glands, glabrous except minutely ciliolate on the teeth, the teeth 5, widely triangular, to 0.3 mm long; corolla often shorter than the hypanthium and the calyx, to 2.5 mm long, the tube short, the lobes 5, oblong, ca. 0.8 mm long, glabrous; stamens 5, the anthers subrotund, ca. 0.8 mm long, the filaments short; stigmas and style ca. 0.5 mm long, the stigmas perhaps

longer and wider than the style. *Fruits* sessile or subsessile, oblong, ca. 5 mm long, usually obtuse at the apex and the base, glabrous, drying red black, sulcate, the persistent calyx scarcely measurable.

Psychotria alboviridula is known from Costa Rica, Panama, Colombia, and Peru. The spikelike and few-flowered branches of the spreading inflorescence coupled with an overall deep coloration when dry make it one of the easiest of the Panamanian *Psychotria* to recognize. Nee's collection *10937* is the only one having fruit. Occasional fruits of this collection are teratological, measuring to 1.5 cm long and appearing like a small fruit of *Ficus*. These swollen fruits may be stimulated by insects. *P. alboviridula* has the largest domatia encountered among the Panamanian species. Steyermark (1972) reduced *P. alboviridula* to the synonymy of *P. remota* Bentham.

DARIÉN: Peak between Río Balsa and Río Aretí, ca. 300 ft, *Duke 8745* (MO). Puerto St. Dorothea, *Dwyer 3218* (MO). PANAMÁ: Between Cerro Jefe and La Eneida, 2100–2900 ft, *Dwyer 8210* (MO). Banks of Río Ipetí, *Folsom & Collins 1664* (MO). Stream flowing out of Serrania de Maje, *Folsom & Collins 1715* (MO). Road from El Llano to Cartí-Tupile, continental divide to 1 mi from divide, 300–500 m, *Liesner 1280* (MO). El Llano-Cartí Road, 16–18½ km by road N of Panamerican Highway, 400–450 m, *Nee & Tyson 19037* (MO). Cerro Azul to Cerro Jefe, *Tyson et al. 4237* (MO). 16–18 km from Panamerican Highway on El Llano-Cartí Road, *Tyson & Nee 7318* (MO). SAN BLAS: Trail from E of Cangandí-Mandinga airport road, 2–5 mi E of Mandinga Airport, *Duke 14774* (MO). COLOMBIA: CHOCO: Between Río Curiche and Alto Curiche, *Duke 9581* (MO). Madurex Logging Camp, *Duke 9933* (MO). Between Río Nercua and Quebrada Barrial and Quebrada Ambrosio near Camp Curiche, 10–294 m, *Duke 11469* (MO). Río Salaqui, Hydro Camp, 1100 ft, *Duke 15777* (MO). N of Alto Curiche, ca. 300 m, *Duke & Idrobo 11223* (MO).

4. **Psychotria allenii** Standley, Ann. Missouri Bot. Gard. 27: 342. 1940. TYPE: Panama, *Allen 1796* (F, holotype; NY, isotype).

Trees 3–10 m tall, the branchlets slender, smooth, ultimately angular, the nodes well spaced. *Leaves* lance oblong to oblong, occasionally oblong rotund or obovate rotund, 5.5–16.0 cm long, 2.3–6.0 cm wide, acute, obtuse or occasionally rounded, the acumen 1.0–1.5 cm long, often falcate, widely cuneate and often inequilateral at the base, the costa slender, immersed, plane or prominulous above, prominulous to subprominent beneath, the lateral veins 6–8(–9), arcuate, prominulous beneath, often dull red, the intervenal areas smooth, the reticulations occasionally evanescent, chartaceous, concolorous, glabrate above and beneath; petioles 1.0–2.5(–3.0) cm long; stipules deciduous, perhaps connate, each part of the sheath subrotund, 1–5 mm long with 2 thickly subulate or triangular lobes, usually shorter than the sheath. *Inflorescences* terminal, solitary, cymose paniculate, exceeding the uppermost leaves, 10–17 cm long, 5–10 cm wide; peduncle 4.5–8.5 cm long, to 0.4 cm wide, stiff, glabrate to puberulent, the branches few; peduncle either terminating in 4–5 radiately disposed branches or the lowermost branches 2–4 from which a rachis extends bearing 2 well-spaced sets of 4–5 verticillately disposed branches, the lowermost branches to 6.5 cm long, these terminated by several few-flowered cymes. *Flowers* small (in bud), sessile, drying red, the hypanthium ca. 0.5 mm long, glabrous, the calycine cup saucer shaped, shorter than the hypanthium, the teeth small or obsolete, triangular, to 0.3 mm long; corolla white, to 4 mm long, the lobes as long as the tube, glabrous outside, the tube densely villose within; stamens 5, the anthers oblong, ca. 1.5 mm long,

the filaments to 0.8 mm long. *Fruits* large, to 1.5 cm in length, carnose, blue, rotund, the fleshy pericarp persisting, the pyrenes hemispherical, smooth except minutely rugulose microscopically, not costate, blue (*Mori & Kallunki 3174*).

Psychotria allenii is known only from Panama. Standley stated: "Like the majority of *Psychotria* species, this one has no outstanding distinctive characters. It is, however, unlike any other known from Central America." Unfortunately Standley did not see fruits, which tend to retain the fleshy portion of the pericarp, unusual in *Psychotria*. The fruits are large, exceeded among Panamanian *Psychotria* only by *P. carnosocarpa, P. chiapensis, P. calophylla,* and *P. olgae*. The relatively smooth blue pyrenes are diagnostic.

COCLÉ: El Valle, *Allen 1796* (MO, NY). Cerro Pilón to El Valle, ca. 2500 ft, *Duke & Dwyer 13903* (MO). Cerro Pilón, ca. 2900 ft, *Dwyer & Lallathin 8629* (MO). La Mesa above El Valle, *Gentry 7425* (MO). PANAMÁ: Cerro Campana, *Croat 14685* (MO). Cerro Campana, *Kirkbride & Hayden 113* (MO). El Llano-Carti Road 17.5 km from Interamerican Highway, 350 m, *Mori & Kallunki 4617* (MO). 5–10 km NE of Altos de Pacora, *Mori & Kallunki 6050* (MO). VERAGUAS: 3.9–5.0 mi S of Santa Fe, *Gentry 2972* (MO). 7 mi W of Santa Fe, *Nee 11155* (MO).

5. **Psychotria bakeri** Dwyer.[85] TYPE: Panama, *Lewis et al. 2249* (MO, holotype).

Shrubs to 1.5 m tall, much branched, the branchlets slender, often flexuous, smooth, glabrous except densely ciliolate within the stipules, ultimately dark red, the nodes turgid, well spaced. *Leaves* elliptic salicoid or elliptic rhomboid, 1.5–6.5(–9.0) cm long, 0.6–1.5(–3.0) cm wide, deltoid toward the apex, acuminate or not, the acumen vague, attenuate acute toward the base, the costa prominulous above, sometimes sulcate, scarcely prominent beneath, to 0.3 mm wide, the lateral veins 8–10, moderately conspicuous beneath, inconspicuous above, the margin slightly callose, somewhat wrinkled, stiffly chartaceous, glabrous, smooth, concolorous, dark red; petioles absent or to 3 mm long; stipules free, often persistent terminally, glabrous, red when dry, somewhat triangular oblong, rhomboid rotund or somewhat rectangular, truncate at the apex, with 2 subulate horns, often unequal in length, sometimes longer than the body. *Inflorescences* terminal, solitary, glabrous except for the bracts and bracteoles, 2–4 cm long, often umbelloid in outline, the peduncle to 2.5 cm long, ca. 0.7 cm wide, often with 3 radiate branches terminating the peduncle, to 1 cm long, the flowers of cymules few, on short branches or on a short rachis extending to 0.7 mm long; bracts and bracteoles minute, ovate, to 1 mm long, acute, concave, ciliolate marginally. *Flowers* sessile, the hypanthium turbinate, 0.8 mm long, glabrous, the calycine cup short, the teeth 5, oblong, 0.5 mm long, obtuse, carnose, glabrous except minutely ciliolate toward the apex; corolla white, the tube cylindrical, to 2.5 mm long, 1.2 mm wide, petaloid, glabrous outside, densely villose within above the

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[85] *Psychotria bakeri* Dwyer, spec. nov. *Frutices* ad 1.5 m alti. *Folia* elliptico-salicoidea vel elliptico-rhomboidea, 1.5–6.5 cm longa, 0.6–1.5 cm lata, venis lateralibus 8–10, venis minoribus inconspicuis, margine leviter calloso, rigido-chartacea, glabra laevia opaco-rubra; petiolis nullis vel ad 3 mm longis; stipulis liberis, ad 4.5 mm longis, apice truncatis cornubus 2 subulatis. *Inflorescentiae* terminales solitariae 2–4 cm longae glabrae. *Flores* sessiles dentibus calycis 0.5 mm longis, glabris praeter minuto-ciliolatis apicem versus; corolla tubo ad 2.5 mm longo. *Fructus* oblongi, ca. 5 mm longi, glabri costati in sicco rubri.

middle of the tube, the lobes 5(?), ovate oblong, to 1.7 mm long, obtuse; stamens 5, the filaments slender, to 1.5 mm long, attached near the middle of the tube; style 2 mm long, slender at base, dilated toward the apex, sparsely ciliolate; the stigmas 2, 0.1 mm long. *Fruits* sessile, oblong, ca. 5 mm long, glabrous, obviously ribbed, drying red.

Psychotria bakeri is named in honor of Dr. Kenneth Baker, long a student of the flora of Panama. It is known only from the type collection. It is closely related to *P. chiriquina* from Cerro Horqueta, Chiriquí, but it differs in its shorter petioles and leaves with fewer lateral veins. The stipules, unlike those of *P. chiriquina*, may persist at the apices of the twiglets and are 2-lobed.

CHIRIQUÍ: Cerro Punta, 2½ km SE of town, *Mori & Kallunki 5660* (MO). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2249* (MO, holotype). PANAMÁ: Cerro Azul, 2000 ft, *Tyson & Blum 4066* (SCZ).

6. **Psychotria berteriana** DC., Prodr. 4: 515. 1830. TYPE: Puerto Rico and Santo Domingo, *Bertero*. Not seen.

P. angustiflora Krause, Bot. Jahrb. Syst. 54. Beibl. 119: 43. 1916. TYPE: Costa Rica, *Tonduz 12996*. Not seen.

P. crebrinervia Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 343. 1929. TYPE: Honduras, *Standley 55286* (F, holotype).

Shrubs or *trees*, to 2.5 m tall, the branchlets 4-angled, minutely puberulent, often red when dry, the nodes well spaced, the subnodal area often constricted on drying. *Leaves* elliptic or obovate elliptic, 7.5–21.0 cm long, 1.5–11.5 cm wide, deltoid or obtuse at the apex, acute or attenuate acute at the base, the costa prominulous above, prominulous beneath, puberulent, the lateral veins 13–20, arcuate, scarcely prominulous but conspicuous beneath, chartaceous, often stiffly so, glabrous above, glabrous beneath except on the veins; petioles slender, 1.0–5.5 cm long; stipules often deciduous, free or shortly connate, to 1 cm long, often cylindrical, each part slightly retuse at the apex, the lobes of each part conspicuously rounded, often spreading with age, scarious marginate, subcoriaceous, glabrous. *Inflorescences* terminal, pyramidal paniculate, to 14 cm long, 5–10 cm wide; peduncle to 7 cm long, relatively stiff, to 0.3 cm wide, puberulent, often drying dark red, the lowermost primary branches opposite, to 5 cm long, the superior primary branches usually well spaced, opposite or alternate and bearing several well-spread pairs of opposite or occasionally alternate secondary branches or sometimes 3 secondary branches terminating a primary branch, the cymules or occasionally individual flowers sessile and disposed along the branches to give a zig-zag effect; bracts and bracteoles persistent, linear or narrowly obovate oblong, the bracts of the lowermost primary branches 0.4–1.0 cm long, paralleling the branches or somewhat reflexed, ciliate. *Flowers* sessile, the calyx and hypanthium 2 mm long, the calycine lobes oblong or triangular, 0.2–1.0 mm long, obtuse or acute, spreading, puberulent; corolla yellow or greenish white, the tube cylindrical or subcampanulate, to 6 mm long, scattered puberulent or minutely puberulent all over outside, puberulent within, petaloid, the lobes oblong, ca. ¼ the length of the tube; anthers oblong, ca. 3 mm long, the filaments ca. 1 mm

long, affixed below the middle of the tube; ovarian disc compressed rotund, to 0.2 mm long, wider than long, the style short, the stigmatic lobes ca. 2 mm long. *Fruits* sessile, ovate oblong or oblong rotund, 3–4 mm long, rounded at the apex, delicately costate, glabrous, the raphides abundant.

Psychotria berteriana occurs in Mexico, Central America, and tropical South America. It also occurs in the West Indies. It has long been recognized as a very variable species which seems closely related to *P. luxurians* Rusby.

BOCAS DEL TORO: Cloud forest above Quebrada Huron on Cerro Bonyic, 500–1200 ft, *Kirkbride & Duke 614* (MO). DARIEŃ: Ascent Cerro Pirre, 100–1600 m, *Duke 5295* (MO). VERAGUAS: 5 mi W of Santa Fé on road past Escuela Agricola Alto Piedra on Pacific side of divide, 800–1200 m, *Liesner 896* (MO). Lower slopes of Cerro Tute, 750–1000 m, *Mori 6244* (MO, US). N of Santa Fé, Escuela Agricola Alto Piedra, *Mori & Kallunki 2534* (MO).

7. **Psychotria boquetensis** Dwyer.[86] TYPE: Panama, *Davidson 709* (MO, holotype).

Shrubs to 1.5 m tall, the branchlets smooth, red when dry, the hairs few, the nodes well spaced, the lenticels dense but inconspicuous. *Leaves* narrowly elliptic or narrowly obovate elliptic, 9.5–13.5 cm long, 2.0–3.5 cm wide, narrowly acute toward the apex, acuminate, the acumen ca. 1 cm long, acute at the base, the costa prominulous or plane above, prominent beneath, the lateral veins ca. 17, arcuate, strongly ascending, papyraceous, drying concolorous, red, the hairs few, elongate or short, disposed on the costa and veins, often aggregated in the axils; petioles 0.3–0.5 cm long, slightly alate on the adaxial side; stipules oblong, to 1.5 cm long, to 0.5 cm wide, obtuse or subacute at the apex, papyraceous, drying red, the hairs few, red. *Inflorescences* terminal, erupting from the enveloping terminal stipule, to 2 cm long, to 1 cm wide, densely ferrugineous puberulent. *Flowers* to 3 mm long; hypanthium short, the calycine cup spathaceous, deeply fissured, the fissure solitary, the teeth 5, in groups of 2 and 3, the cup petaloid, carnose, the hairs outside few, spreading, eglandular within, the teeth unequal, subulate, 1–2 mm long; corolla with the tube short, 3.5 mm long, ca. 1 mm wide, villose within near the filament attachment position, the lobes oblong, ca. 1.5 mm long; stamens 5, the anthers oblong, 0.7 mm long, the filaments 0.7 mm long, attached near the mouth, villose at the base; style ca. 1 mm long, thick, the stigmas ca. 0.35 mm long; ovarian disc pulviniform, ca. 0.5 mm long. *Fruits* not seen.

Psychotria boquetensis is known only from Panama. It is the only *Psychotria* I have encountered with the calyx spathaceous.

CHIRIQUÍ: Boquete, 3800 ft, *Davidson 709* (MO).

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[86] *Psychotria boquetensis* Dwyer, spec. nov. *Frutices* ad 1.5 m alti, ramulis laevibus in sicco rubris ciliis paucis ornatis. *Folia* angusto-elliptica vel anguste obovato-elliptica, 9.5–13.5 cm longa, 2.0–3.5 cm lata, ad apicem attenuato-acuta, venis lateralibus ca. 17, papyracea, ciliis paucis solum in venis costaque; petiolis 0.3–0.5 cm longis; stipulis oblongis, ad 1.5 cm longis, apice obtusis vel subacutis ciliis paucis. *Inflorescentiae* terminales ex stipulis terminalibus eruptae, ad 2 cm longae. *Flores* cupula calycis spathacea fissura alta solitaria notata dentibus 5 sic binis ternique dispositis, 1–2 mm longis; corolla tubo ca. 3.5 mm longo; antheris ca. 0.7 mm longis. *Fructus* non visi.

8. **Psychotria brachybotrya** Muell.-Arg. in Mart., Fl. Bras. 6(5): 327. 1881. TYPE: Brazil, *Spruce 2190*. Not seen.

P. iquitosensis Standl., Field Mus. Nat. Hist., Bot. Ser. 8: 195. 1930. TYPE: Peru, *Llewelyn Williams 1391* (F, holotype).

Shrubs to 2.5 m tall, the stems smooth, glabrous, often drying yellow, the nodes well spaced, the pith sometimes porate. *Leaves* elliptic to ovate elliptic, 7–15(–22) cm long, 2.5–9.0(–13.0) cm wide, usually deltoid or attenuate acute, the acumen often vague, to 1.5 cm long, often falcate, basally acute, attenuate acute to cuneate, the costa prominulous above and beneath, the lateral veins ca. 9(–12?), strongly ascending, arcuate, uniting near the margin to form an undulate vein, thinly papyraceous, usually drying green or tan, concolorous, glabrous above and beneath or with well spaced, small appressed white hairs; stipules persistent, connate, the sheath short, turgid, 0.1–0.3 mm long, each part with 2 awns to twice the length of the body, glabrous. *Inflorescences* terminal, solitary, usually 1.0–1.5 cm long at early anthesis, in fruit to 3(4?) cm long, the peduncle absent or to 1.2 cm long, glabrous to puberulent, the branches either reduced and scarcely measurable or to 1 cm long, disposed in 2–3 opposite pairs perpendicular or deflexed to the rachis; bracts arising from the proximal portion of the branches, foliose, oblong lanceolate or narrowly oblong, 0.6–0.8 cm long, to 0.2 cm wide, glabrate, narrowly deltoid at the apex, ultimately obtuse; bracteoles surrounding the few-flowered clusters scarcely smaller than the bracts, ascending, involucrate, hiding the small flowers. *Flowers* sessile, the hypanthium short, glandular shiny, glabrate to pubescent, the margin erosulose or with 5 triangular teeth, to 0.3 mm long, ciliolate, usually with a minute gland at the sinuses; corolla white, the tube ca. 2 mm long, petaloid, puberulent outside, villose within, the lobes 5, oblong, to 1.5 mm long, obtuse; anthers narrowly oblong, ca. 1 mm long, obtuse, the filaments ca. 0.5 mm long, affixed above the middle; style ca. 4 mm long, the stigmas 0.2 mm long; ovarian disc compressed rotund, 0.5 mm long. *Fruits* sessile, rotund, to 3 mm in diam., glabrous with abundant raphides, conspicuously costate, the remnants of the calyx scarcely visible.

Psychotria brachybotrya is known from Panama, Trinidad, northern South America to Bolivia. Apparently the photo in the type at Missouri (MO) of a Martius collection from Brazil is not one of the type.

BOCAS DEL TORO: W of Almirante, *Blum 1358* (MO). Water Valley, Chiriquí Lagoon, *Wedel 1638* (MO). CANAL ZONE: Juan Mina, *Bartlett & Lasser 16559* (MO). Río Piedras, road to Portobelo, *Blum et al. 2521* (MO). Pipeline Road, 14 mi NW of Gamboa, *Croat 12365* (MO). 2 mi NW of Summit Garden, *Croat 16588* (MO). Toro Point, Fort Sherman, *Tyson 4420* (MO). Coco Solo, U.S. Army Tropic Test Center, *Dwyer & Duke 7873* (GH, MO, UC, US). Navy Pipeline Reserve Area, NW of Gamboa, *Stimson 5342* (MO). 6 mi N of Gamboa, S of Río Frijol, *Tyson 1506* (MO). BARRO COLORADO ISLAND: *Croat 11132* (MO); *Foster 1783* (MO). COCLÉ: El Valle, cloud forest, 800–1000 m, *Duke 13210* (MO). COLÓN: Maria Chiquita, E of Río Piedras, *Dwyer 7805* (GH, K, MO, NY, UC, US). Achiote, *Tyson et al. 4513* (MO). DARIÉN: Cativo Swamp, near Tusijuanda, *Duke 13523* (MO). Trail between Caná and Boca de Cupe, *Stern et al. 612* (MO). Caná, 1750 ft, *Stern et al. 659* (MO). HERRERA: Without other locality, *Ebinger 174* (MO). PANAMÁ: Cerro Azul, *Dwyer 2752, 3109, 4051A* (all MO). 1.5 mi S of Goofy Lake, *Dwyer & Hayden 8022* (GH, MO, US). Fort San Lorenzo, *Hayden 110* (MO). Cerro Campana, 2800 ft, *McDaniel 6910* (MO). Isla Taboga, *Woodson et al. 1457* (MO).

9. **Psychotria brachiata** Swartz, Prodr. 45. 1788. TYPE: not seen.

P. caerulea Ruiz & Pavón, Fl. Peruv. Chil. 2: 62. 1799. TYPE: Peru, *Ruiz & Pavon* (MO, photo of isotype? in Delessert Herb.).
Palicourea caerulea (Ruiz & Pavón) R. & S., Syst. Veg. 5: 194. 1819.
Cephaelis polycephala Schlecht., Linnaea 28: 532. 1856. TYPE: Peru, *Lechler 2364*. Not seen.

Trees to 5 m tall, the branchlets smooth, glabrous, the nodes well spaced. *Leaves* oblong or lanceolate, occasionally obovate elliptic, 7–16 cm long, 3–7 cm wide, obtuse or widely cuneate at the apex, the acumen to 1 cm, basally acute or rarely obtuse, often slightly inequilateral, the costa prominulous above, prominent beneath, usually laterally villose, the lateral veins 9–12, arcuate or occasionally subperpendicular, the intervenal areas spreading reticulate, papyraceous, concolorous; petioles to 2.5(–3.5) cm long, glabrous, slender, 0.15 cm wide; stipules free, oblong or oblong rotund, 2–4 mm long, often bilobed, the lobes ca. 1 mm long, obtuse or rounded, 3–4 mm wide basally, appressed, scarious, glabrous or occasionally pubescent, appressed setose submarginally within. *Inflorescences* terminal, solitary, 5–22 cm long, 3.5–7.0 cm wide, thrysoid or racemiform paniculate, usually rigidly upright, glabrous to puberulent, rarely epedunculate and then with branches in pairs or in 3's arising from the stem tip, usually with peduncles to 5.5 cm long, 0.8–1.0 mm wide, angular, usually with 2–4 pairs of well spaced, opposite branches 1–3(–4) cm apart, to 9 cm long, the uppermost branches occasionally about as long as the lowermost pair, usually perpendicular, occasionally deflexed, the flowers aggregated into compressed rotund heads terminating the branches, these wider than long, to 1 cm wide; bracts at the base of the branches involute, oblong, to 8 mm long; floral bracts usually carinate, the outer bracts larger, to 6 mm long, to 5 mm wide, the inner bracts ca. 4 mm long, narrower. *Flowers* with the hypanthium short, the calycine cup a membranous, inflated cuplike structure, 1.5–3.0 mm long, the margin irregular or with irregular, triangular teeth, to 0.8 mm long, ciliolate outside; corolla yellow or greenish white, the tube 4–5 mm long, carnose, pubescent outside, the lobes 5, ovate oblong or triangular, 1 mm long; stamens 5, the anthers oblong, 1.3–2.0 mm long, obtuse, often minutely apiculate, the filaments 3 mm long, attached (in bud) below the middle of the tube; ovarian disc compressed rotund, ca. 0.35 mm long, 0.5 mm wide, the style slender, 1.5–2.0 mm long, the stigmas 2, digitiform, 1.0–1.8 mm long. *Fruits* succulent, china blue or blue black, ellipsoid to subrotund, to 1 cm long, the pyrenes costate, glabrous to occasionally puberulent, the persistent calyx cupuliform, to 1.5 mm long.

Psychotria brachiata is known from Central America, South America, the West Indies, and Trinidad. Steyermark (1972) regards *P. caerulea* as distinct from *P. brachiata*, stressing characteristics of the calyx, corolla, and inflorescence. I regard them as conspecific, agreeing with Standley's treatment in the Flora of Peru (1936) in which *P. caerulea* is reduced to the synonomy of *P. brachiata*. *Duke 13615* lists the common name "Pugabaca pacuru" of the Choco Indians, the leaves being used as a purgative.

BOCAS DEL TORO: Río Teribe between Quebrada Huron and Puerto Palenque, 400–800 ft, *Kirkbride & Duke 503, 506* (both MO). Chiriquicito, *Lewis et al. 1973* (COL, MO, UC, VEN). Without

specific locality, *Wedel 177* (MO). Chiriquí Lagoon, *Wedel 1329* (MO), *1638, 2196 A* (both US). Río Cricamola between Finca St. Louis and Konkintoe, *Woodson et al. 1928* (MO). CANAL ZONE: France Field, *Blum & Dwyer 2123* (MO). Road S-11 NW of Escobal, *Croat 12457* (MO). Fort Sherman, *Dwyer 6686* (MO); *Dwyer & Robyns 173* (MO). Chagres, *Fendler 63* (MO). Coco Solo, *Gentry 6489* (MO). Pipeline Road, Limbo Hunt Club, *Kennedy & Tyson 1868* (MO). Agua Clara, *Pittier 3993* (MO). Fort Sherman, *Standley 31072* (US); *Tyson 1649* (MO); *Tyson & Blum 1657* (MO). BARRO COLORADO ISLAND: *Croat 11231, 11699, 12184, 13251 A, 14555, 15149, 15252 A* (all MO); *Shattuck 1069* (MO); *Standley 40997* (US). COCLÉ: Boca del Toabré, confluence of Río Toabré and Río Cocle del Norte, *Lewis et al. 4435* (COL, MO, SCZ, UC, VEN). COLÓN: Las Cruces Trail at Portobelo, *Ebinger 109, 257* (both MO). Achiote, *Tyson et al. 4555* (MO). DARIÉN: Without other locality, *Bristan 165* (MO). Caná, *Croat 27316* (MO). Loma Cuasí behind Manené, *Duke 13615* (MO). Between Paya and Palo de Los Letras, *Duke & Kirkbride 14036* (MO). E of Tres Bocas, shortest headwaters of Río Cuasi, *Kirkbride & Duke 1158* (MO). Caná, *Stern et al. 467, 478, 668* (all MO, US). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2198* (MO, UC). PANAMÁ: Altos del Río Pacora, 2500 ft, *Lewis et al. 2322* (COL, DUKE, MO). SAN BLAS: 15–20 km WSW of Puerto Obaldía, *Mori et al. 6852* (MO). VERAGUAS: Valley of Río Dos Bocas, 11–13 km beyond Agriculture School, Santa Fé, 350–500 m, *Croat 25717* (MO). 5 mi W of Santa Fé, past Escuela Agricola, *Liesner 846* (MO).

10. **Psychotria calophylla** Standley, Contr. U.S. Natl. Herb. 18: 129. 1916. TYPE: Panama, *Fendler 60* (US, holotype).

P. gatunensis Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 142. 1967. TYPE: Panama, *Johnston 1554* (MO).

P. grandicarpa Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 42. 1968. TYPE: Panama, *Dwyer 7244* (MO).

Trees to 8 m tall or *shrubs*, the branchlets at first terete, ultimately angular, often with porous pith, minutely farinose puberulent or ferrugineous villose. *Leaves* oblong, oblong rotund or obovate, 13–28 cm long, 3.7–15.5 cm wide, tapering obtusely, widely cuneate or rounded at the apex, the acumen none or to 0.5 cm long, basally acute, often abruptly contracted with a spatulate appearance, often markedly inequilateral at the base, the costa subplane above, often grooved, prominent beneath, to 0.4 cm wide proximally, the lateral veins (11–)13–19(–30), the lowermost subperpendicular, the upper veins often arcuate, subcoriaceous, drying deep red brown or gray green, glabrate or mealy punctate above, beneath ferrugineous villosulose, especially on the costa and the veins; petioles stout, 1.5–4.0 cm long, to 0.35 cm wide, glabrate to pubescent, the lamina often decurrent; stipules deciduous, free, compressed rectangular, ca. 4 mm long, densely ferrugineous pubescent, coriaceous, with 2 proximate, subulate awns, to 6 mm long, ca. 2 mm wide at the base. *Inflorescences* terminal, solitary, thrysoid paniculate, to 15 cm long, to 15 cm wide, densely ferrugineous pubescent, sessile or with peduncles 2.5–5.5 cm long, stout, 0.3–0.4 cm wide, the branches of 2–3 well-spaced pairs, 2.5–5.5 cm apart, at least the lowermost 2 pairs opposite, arcuate or sharply ascending, the lowermost to 7 cm long, the flowers in globose fascicles, to 1.5 cm wide; bracts triangular ovate, to 2 mm long, acuminate. *Flowers* subsessile or sessile; hypanthium subrotund, ca. 1.8 mm long, densely ferrugineous puberulent, the calycine cup scarcely measurable, glabrous and eglandular inside, the teeth 5, triangular or widely oblong, 0.2–2.0 mm long; corolla white or greenish white, the tube cylindrical, inflated above, 3–6 mm long, minutely puberulent outside and densely villose near the mouth, the hairs to 2.2 mm long, the lobes 5, rectangular oblong, to 3 mm long, galeate and crassate; stamens 5, the anthers oblong, 1.2–1.7 mm long, the filaments ca. 1 mm long; styles short and long, 1.5–6.0 mm long, the stigmas 2, 0.65–0.8 mm long. *Fruits*

elliptic, often falcate (by abortion of one seed?), 1.3–1.5 cm long, 0.6–0.7 cm wide, each pyrene 5-ribbed, sparsely pubescent, drying black; pedicels to 0.4 cm long.

Psychotria calophylla is limited to three provinces of Panama and to Costa Rica. Dr. Croat's two collections in Costa Rica have an unusual number of lateral veins, numbering between 20 and 30.

CANAL ZONE: Chagres, *Fendler 60* (MO, US). Pipeline Road, 5–10 mi N of Gamboa, *Gentry 2659* (MO). 6–8 mi N of Gamboa, *Gentry & Dwyer 3361* (MO). W of Limon Bay, Gatún Locks and Gatún Lake, *Johnston 1554* (MO). Road S-8 and road to towers at Loma la Toba, *Nee 8946* (MO). Pipeline Road, 10 km NW of Gamboa, *Nee 9600* (MO). COLOŃ: Miguel de la Borda, *Croat 10036* (MO). Santa Rita Ridge, *Dwyer 8572* (MO). Río Guanche, *Gentry 8790* (MO). Santa Rita Ridge Road, 4 mi from Transisthmian Highway, *Gentry et al. 8867* (MO, US). Salud, *Lao & Holdridge 207* (MO). Santa Rita Road, ca. 8.5 km from Boyd-Roosevelt Highway, *Mori & Kallunki 2076* (MO). Río Guanche, ca. 2.5 km upriver from bridge to Portobelo, *Mori & Kallunki 3719* (MO). Santa Rita Ridge Road, 10.2 km from Boyd-Roosevelt Highway, *Mori & Kallunki 5065* (MO). Río Guanche, *Mori & Witherspoon 7951* (MO). Río Guanche, 6 km S of Portobelo, *Nee & Gentry 8688* (MO). Achiote, *Tyson et al. 4532* (MO). Río Guanche, 2 km upstream from bridge, *Witherspoon 7973* (MO). PANAMÁ: Cerro Azul, *Duke 9363* (MO). Cerro Jefe, *Dwyer et al. 7244* (MO); *Gentry et al. 3513* (MO). El Llano-Carti Road, 9.6–11.0 km from Interamerican Highway, 1100–1200 ft, *Mori & Kallunki 3528* (MO). COSTA RICA: LIMON: Near Río Sixaola ca. ½ mi SW of Bambú, 15 m, *Croat 43250* (MO). Between Limon and Shiroles, along Río Sixaola, 0.9 mi SW of Bambú, *Croat 43303* (MO).

11. **Psychotria capacifolia** Dwyer.[87] TYPE: Panama, *Kirkbride & Duke 601* (MO, holotype).

Subshrubs, succulent, erect, unbranching, to 1 m tall, the stem smooth. *Leaves* large, oblong, to 40 cm long, to 20 cm wide, widely deltoid at the apex, often ultimately obtuse, basally widely cuneate to obtuse, the costa subplane and canaliculate above, somewhat prominent beneath, to 0.4 cm wide, the lateral veins ca. 30, spreading arcuate, to 1.8 cm apart, conspicuous beneath, the intervenal areas with the veinlets slender, spreading, thinly coriaceous when dry, brown, discolorous; petioles to 10 cm long, slightly alate, diffusely ciliate; stipules not seen. *Inflorescences* axillary, narrowly paniculate, to 50 cm long, to 24 cm wide, the peduncle elongate, the few branches opposite, disposed in about 6 pairs. *Flowers* with the hypanthium subrotund, the calycine cup to 1 mm long, the lobes 5, triangular, to 0.4 mm long, obtuse or acute, sparsely ciliate; corolla white, the tube subcampanulate, to 3 mm long, expanded at the apex, to 2.5 mm wide, ca. 0.4 mm wide toward the base, thinly carnose, glabrous outside, diffusely pilose within near the filament attachment, the lobes 5, scarcely shorter than the tube, ovate oblong, 1.5–1.9 mm long, cuneate toward the apex with a round mass of hairs on the adaxial surface at the apex; stamens 5, exserted, the anthers oblong, ca. 1.1 mm long, the filaments ca. 1 mm long, arising near the mouth;

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[87] *Psychotria capacifolia* Dwyer, spec. nov. *Suffrutices* succulenti erecti simplices, ad 1 m alti. *Folia* magna oblonga, ad 40 cm longa, ad 20 cm lata, apice lato-deltoidea venis lateralibus ca. 30, tenui-coriacea in sicco; petiolis ad 10 cm longis. *Inflorescentiae* axillares angusto-paniculatae, ad 0.5 m longae, ad 24 cm latae, pedunculo longo ramis oppositis in jugis 6 dispositis. *Flores* cupula calycis ad 1 mm longa, lobis 5, ad 0.4 mm longis, sparso-ciliatis; corolla tubo ad 3 mm longo, extus glabro lobis 1.5–1.8 mm longis apice caespite rotundo adaxiali ciliorum praeditis; staminibus 5, antheris oblongis, ca. 1.1 mm longis. *Fructus* viridi-lutei.

style slender, ca. 4 mm long, the stigmas 2, linear, ca. 2 mm long. *Fruits* yellow green.

Psychotria capacifolia is known only from Panama. It is distinguished by being a small succulent subshrub with elongate leaf blades supported by elongate petioles. As is characteristic of succulent species of *Psychotria*, the inflorescence is axillary. The inflorescence is as long or longer than any *Psychotria* in Panama. A diagnostic floral character is the ball of hairs borne on the inside tip of the corolla lobe.

BOCAS DEL TORO: Cloud forest above Quebrada Huron on Cerro Bonyik, 500–1200 ft, *Kirkbride & Duke 601* (MO). DARIÉN: Serranía de Pirre, along ascent of Serranía de Pirre above Caná gold mine between Río Caná and Río Escucha Ruido, 600–1000 m, *Croat 37731* (MO).

12. **Psychotria capitata** Ruiz & Pavón, Fl. Peruv. Chil. 2: 59. 1799. TYPE: Chinchao, Huanuco, Peru, *Ruiz & Pavon*. Not seen.

P. inundata Benth., J. Bot. (Hooker) 3: 229. 1841. TYPE: Essequibo, British Guiana, *Schomburgk 27*. Not seen.

P. albonervia Standley, Contr. U.S. Natl. Herb. 18: 131. 1916. Not Jacq. TYPE: Panama, *Fendler 62* (US, holotype; isotype, MO).

Palicourea stevensonii Standley, Trop. Woods 16, 32. 1928. TYPE: Belize, *Stevenson 10683* (NY, holotype).

12a. **Psychotria capitata** Ruiz & Pavón ssp. **capitata.**

Shrubs or *trees* to 4 m tall, the branchlets ramose, terete, smooth, glabrous, the pith abundant. *Leaves* elliptic oblong, 4–17 cm long, 1.5–7.0 cm wide, apically deltoid to subacute, occasionally rounded with an acumen to 1.5 cm long, often falcate, basally cuneate or occasionally obtuse, the costa prominulous above, prominent beneath, the lateral veins 12–18(–20), conspicuous, widely arcuate, usually drying white in contrast to the lamina, prominulous above and beneath with 1 (or 2–3) irregular subparallel veins between adjacent lateral veins, these soon disappearing or branching, the intervenal areas spreading reticulate, stiffly papyraceous, concolorous, drying green, glabrous; petioles to 2 cm long, often reflexed, glabrous; stipules free, often persistent, especially at the tips of the twigs, oblong, ovate oblong, 10–20 mm long, 4.5–5.5 mm wide at the base, variable at the apex, usually 2-lobed, the lobes 1–2 mm long or more than 2 times the length of the body, rarely undivided and simply acute, scarious and puberulent. *Inflorescences* terminal, solitary, ovate oblong, oblong or pyramidal, 4–14 cm long, 2.5–8.0 cm wide, puberulent to glabrate, the peduncles 3–6 cm long, usually strict, the lowermost branches 3–4-verticillate or disposed as a pair, the upper pairs usually 2 or 3 and opposite; bracts linear or lanceolate, to 1.5 cm long, about equaling the flowers. *Flowers* sessile; hypanthium rotund, ca. 1.5 mm in diam., the calycine cup ca. 0.5 mm long, glabrous, petaloid, the lobes 4–5, disposed as irregular points or to 1 mm long; corolla white, white with yellow throat or green, the tube 5–9 mm long, glabrous outside, pilose within, the lobes 5, oblong, 2.5–4.5 mm long, glabrous; stamens 5, the anthers oblong, ca. 1.5 mm long, sessile or the filaments to 4 mm long; ovarian disc bilobed, to 1 mm long, the style 3–7 mm long, somewhat expanded above the middle. *Fruits* ovate,

oblong or subrotund, 4–6 mm long, ca. 3.5 mm wide, each pyrene 4–5 costate, glabrous, black or purple.

Psychotria capitata is known from Central America, tropical South America, and Trinidad and Tobago. This is one of the easiest of the Panamanian species of *Psychotria* to recognize because of the stiff leaves which in the field rattle in the breeze, as well as the usually ghostly white appearance of the inflorescence. Croat on two collections from Barro Colorado Island notes that the flowers are pollinated by black and white butterflies and that the "long-stylar form (is) visited by small, greenish black hummingbirds." One pollinator is the *Heliconius* butterfly, a familiar pollinator of the Cucurbitaceae. Steyermark (1972) distinguished *P. capitata* subsp. *amplifolia* (Raeuschel) Steyermark as occurring in Central America including Panama, as well as in French Guiana, Surinam, and British Guiana.

CANAL ZONE: Madden Dam, *Dwyer 6938* (MO). Fort Sherman, *Hayden 86* (MO). Top of Cerro Pelado, 1 km N of Gamboa, *Nee 8826* (MO). Road C-29, 6 km E of Gamboa, *Nee 8989* (MO). Fort Sherman, *Tyson & Dwyer 1239* (MO). BARRO COLORADO ISLAND: *Croat 4344, 4349, 6652, 10910, 10985, 12414, 14932, 14959, 14960* (all MO); *Ebinger 570* (MO); *Shattuck 1090* (MO). COCLÉ: El Valle, *Allen 1896, 3536* (both MO). Las Margaritas and El Valle, *Woodson et al. 1759* (A, MO). COLOŃ: Santa Rita Ridge, *Correa & Dressler 890* (MO); *Dwyer & Gentry 8351* (MO); *Dwyer 8419* (MO); *Dwyer et al. 8986, 8996* (both MO). SW of Piña, *Lewis et al. 1851* (MO, UC). Between Río Piedras and Puerto Pilón, *Lewis et al. 3211* (COL, MO, UC, VEN). Santa Rita Ridge, *Lewis et al. 5386* (MO, SCZ, UC); *Mori & Kallunki 1788* (MO). Río Boqueron to Boqueron, Mine #2 N of Peluca Hydrographic Station, *Mori & Kallunki 2432* (MO). Río Guanche, 6 km S of Portobelo, *Nee & Gentry 8688* (MO). 4 km NW of Salamanca, 13 km NE of Buenos Aires, *Nee 9076* (MO). San Lorenzo, *Quistgaard 7* (MO). NE of Santa Rita Ridge, *Wilbur & Weaver 10820* (MO). DARIEŃ: Río Sancanti, ca. 2 mi upstream from Piriá, *Duke 14363* (MO). PANAMÁ: Cerro Jefe, *Busey 799* (MO). Cerro Azul, *Carrera 6* (MO); *Croat 11552* (MO). Cerro Campana, *Croat 12101* (MO). Goofy Lake to Cerro Jefe, *Correa & Dressler 581* (MO). Cerro Jefe, *Davidse & D'Arcy 10, 112* (MO). Panama Viejo, *Duke 5743, 5744* (both MO). Cerro Jefe, *Duke 9357, 9399* (both MO). Cerro Azul, *Dwyer 1877, 3075, 7075* (all MO). Cerro Jefe, *Dwyer 8483* (MO). 1.5 mi S of Goofy Lake, *Dwyer & Hayden 8031* (GH, MO, US). Cerro Jefe and La Eneida, *Dwyer et al. 8209* (MO). Cerro Azul, *Ebinger 414* (MO). La Campana, Cerro Campana, *Ebinger 934* (MO). Cerro Jefe, *Elias & Hayden 1803* (MO, UC, VEN); *Gentry 2123, 2127, 6778* (all MO). 4.8 mi N of Highway, W of El Llano, *Gentry 5095* (MO). Cerro Azul, *Gomez-Pompa 3393, 3420* (both MO). Río Tocumen, N of Chepo Road, *Hunter & Allen 227* (MO). Cerro Jefe, *Kirkbride & Crebbs 35* (MO). Cerro Campana, *Lewis et al. 1944* (GH, MO). Altos del Río Pacora, *Lewis et al. 2317* (MO, UC), *2318* (MO, UC, VEN). Cerro Campana, *Luteyn 963, 1031* (both MO). Gorgas Memorial Labs, 5–10 km NE of Altos de Pacora, 600 m, *Mori & Kallunki 3328* (MO). 4.5 km N of Lago Cerro Azul, 675 m, *Nee 7013* (MO). Goofy Lake, *Oliver et al. 2680* (MO, UC). Cerro Azul, *Porter et al. 4102* (MO); *Stimson et al. 5165* (MO); *Tyson 2074, 2085, 2092, 4065, 4086* (all MO). Cerro Jefe, *Tyson et al. 3334, 3382, 4360, 4370* (all MO). Cermeño, *Varela 24* (MO). Arraijan, *Woodson et al. 775* (A, MO). SAN BLAS: E of Cangandí-Mandinga airport road, *Duke 14795* (MO, OH). Mainland opposite Playon Chico, *Gentry 6394* (MO). Between the Atlantic Coast and Continental Divide, opposite Cartí, *Kennedy 2608* (MO). VERAGUAS: Santa Fé, slopes of Cerro Tuté, *Gentry 6234, 6235* (both MO).

12b. **Psychotria capitata** subsp. **fissistipularis** Dwyer.[88] TYPE: Panama, *Croat 10037* (MO, holotype).

Similar to *Psychotria capitata* subsp. *capitata* except stipules to 15 mm long, the 2 lobes triangular oblong, longer than the body of the stipule, erect or some-

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[88] *Psychotria capitata* subsp. *fissistipularis* Dwyer, subsp. nov. Differt a *P. capitata* subsp. *capitata* stipulis ad 15 mm longis, lobis 2 triangulari-oblongis, corpore longioribus margine ciliolato; bracteis involucratis, ovatis vel ovato-oblongis, 5.0–6.5 mm longis, 2.5–3.0 mm latis.

what falcate, ciliolate marginally; bracts of each floral cluster involucrate, ovate or ovate oblong, 5.0–6.5 mm long, 2.5–3.0 mm wide, venose, marginally ciliolate.

CANAL ZONE: Chagres, *Fendler 62* (MO, US). COLÓN: Miguel de la Borda, edge of forest near beach, *Croat 10037* (MO).

12c. **Psychotria capitata** ssp. **rubra** Dwyer.[89] TYPE: Panama, *Folsom & Skog 2454* (MO).

Similar to *P. capitata* ssp. *capitata* except the bracts are red and the anthers are about ½ the length.

This is the first collection of *P. capitata* on the now well-collected El Llano to Carti Road, an area which usually has the majority of taxa found on the Santa Rita Ridge road (Prov. Colon) and on Cerro Jefe (Prov. Panama). *Psychotria capitata* ssp. *capitata* has been collected several times in both places.

13. **Psychotria carnosocarpa** Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 41. 1968. TYPE: Panama, *Dwyer et al. 964* (MO, holotype).

Shrubs, the branchlets rigid, divergent, ashen brown, glabrescent except densely hirsute toward the apex. *Leaves* oblong, to 13 cm long, to 5.5 cm wide, deltoid at the apex with an acumen ca. 1 mm long, cuneate at the base, the costa prominulous, the lateral veins ca. 12, rigidly ascending then arcuate near the margin, 0.5–1.2 cm apart, rigidly papyraceous, discolorous, conspicuously villose beneath, the hairs dense, appressed, ascending; petioles to 1.5 cm long, densely villosulose; stipules free, the body indistinct, the 2 awns subulate, to 0.9 cm long, densely hirsute. *Inflorescences* terminal, paniculate, densely puberulent, short, to 6 cm long, ca. 4 cm wide, the peduncle to 2.2 cm long, the branches few, the lowermost usually 4, radiate, to 4 cm long. *Flowers* not seen. *Fruits* didymous, the lobes of the calyx short, often puberulent, subrotund or compressed rotund, ca. 5 mm long, 4.5–7.0 mm wide, carnose when mature, drying black, glabrescent, the pyrenes 2.

This species is known only from Panama.

BOCAS DEL TORO: Junction Río Changuinola and Río Terebe, *Dwyer et al. 964* (MO). Changuinola to 5 mi S at junction of Río Changuinola and Río Terebe, *Lewis et al. 964* (MO).

14. **Psychotria carthaginensis** Jacq.[90] Enum. Pl. Carib. 16. 1760. TYPE: Colombia, *Jacquin*. Not seen.

P. foveolata Ruiz & Pavón, Fl. Peruv. Chil. 2: 59. 1799. TYPE: Peru, *Ruiz & Pavon*. Not seen.
P. alba Ruiz & Pavón, Fl. Peruv. Chil. 2: 58. 1799. TYPE: Peru, *Ruiz & Pavon*. Not seen.
P. fockeana Miq., Linnaea 18: 296. 1844. TYPE: Surinam, *Focke 269*. Not seen.

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[89] *Psychotria capitata* ssp. *rubra* Dwyer, ssp. nov. Differt a *P. capitata* ssp. *capitata* bracteis rubris; antheris sole 0.8 mm longis.

[90] For more complete synonymy see Steyermark, 1972.

Shrubs to 4 m tall, the branchlets terete, smooth, glabrous, the nodes often proximate, the pith present or absent, if present, often drying dark. *Leaves* narrowly obovate lanceolate or obovate oblong, occasionally inequilateral, 5–13 cm long, 1.8–4.5 cm wide, tapering obtusely or deltoidly toward the apex, acute or vaguely acuminate, the acumen usually widely deltoid and obtuse, basally attenuate acute, the costa slender, plane or grooved above, prominulous beneath, papyraceous, glabrous, often drying red, the lateral veins 8–9, widely arcuate; petioles 0.2–1.0 cm long, the blade lightly decurrent; stipules caducous, oblong to ovate triangular, to 8 mm long, obtuse, brown, glabrous. *Inflorescences* terminal, solitary, paniculate, usually widely ovate rotund in outline, to 9 cm long, to 5.5 cm wide, glabrous, the peduncles wiry, angular, usually stiff, to 5 cm long, to 0.15 cm wide, the primary branches 4-nate, occasionally opposite, radiate and usually ascending, to 1.5 cm long, the next pair above opposite or 4-nate, the rachis then terminated by several short branches; bracts ovate triangular, to 1 mm long. *Flowers* subsessile; hypanthium oblong rotund, ca. 1 mm long, minutely puberulent, the calycine cup 0.3 mm long, carnose with a few small glands within, puberulent marginally, the teeth 5, scarcely distinguishable; corolla white, ca. 5 mm long, the tube subcampanulate, ca. 3 mm long, constricted below the middle, glabrous or puberulent externally, bearded above the middle within, the lobes 5, oblong, ca. 2 mm long, 1.2 mm wide, carnose petaloid; stamens 5, the anthers oblong, ca. 0.8 mm long, dorsifixed near the base, the filaments ca. 2 mm long, attached ca. 1 mm below the mouth; style 4 mm long, dilated above the middle, the stigmas crassate, ca. 1 mm long; ovarian disc ca. 0.3 mm long, annular. *Fruits* to 5.5 mm long, rounded at the apex and base, drying red, glabrous, the raphides abundant, 10-ribbed, the ribs rounded, 10-sulcate, the calycine cup persisting, scarcely evident; pedicels to 2 mm, oblong.

Psychotria carthaginensis is a common species throughout Central America and South America, and it also occurs in Trinidad and Tobago. I have reduced *P. alba* Ruiz & Pavón to synonomy following L. B. Smith's recommendation (1958). The Panamanian material heretofore identified as *P. alba* is poor.

CANAL ZONE: Between Madden Wye and Summit Naval Radio Station, *Croat 15023* (MO). C-15 Road, *Blum & Dwyer 2494* (MO). Quarry Heights, *Dwyer 2622* (MO). Fort Clayton, *Dwyer & Robyns 8* (MO). Culebra, *Killip 3430* (US). Mt. Hope, *Heriberto* (US). Chivi-Chivi Trail, *Maxon & Harvey 6582* (US). Ancón, *Piper 5554* (US). Gamboa, *Pittier 3414* (A, US). Balboa, *Standley 25501, 27125, 29269, 32119, 32129* (all US). Río Paraíso, *Standley 29845, 29855* (both US). 12 mi S of Colón, Río Providencia, *Tyson & Blum 3988* (MO). BARRO COLORADO ISLAND: *Croat 10337, 10347, 15110* (all MO). CHIRIQUÍ: NW side of Cerro Pando, *Croat 15590* (MO). Monte Rey above Boquete, *Croat 15710* (MO). Las Cumbres, Cerro Punta, *Croat & Porter 16116* (MO). Cerro Colorado, *Folsom & Collins 1771* (MO). Road to Bajo Mono, *Folsom et al. 2250* (MO). El Volcan, *White 187* (MO). Upper Chiriquí Viejo, 1300–1900 m, *White & White 10* (MO). COCLÉ: El Valle, *Folsom & Kauke 2748* (MO); *Lewis et al. 3543* (MO). Penonomé, *Williams 59, 239* (both US). DARIÉN: Río Chico, *Burch et al. 1118* (MO, SCZ). Río Sambú, *Duke 9279* (MO). 2 km N of Santa Fé, *Duke 10230* (MO). HERRERA: Ocú, Río Pasoancho, *Stern et al. 1735* (MO). LOS SANTOS: Punta Mala, *D'Arcy & Croat 4222* (MO). Pedasí, *Dwyer 2489* (MO). 9 mi N of Tonosí, *Luteyn & Foster 1387* (MO). Tonosí, *Stern et al. 1813* (MO, US). PANAMÁ: El Llano, *Duke 5517, 5517a* (both MO). Cermeño, *Dwyer 6560, 6588* (both MO); *Dwyer & Robyns 3* (MO). San Jose Island, *Erlanson 91* (US). Chorrera, *Killip 3407* (US). Río Tocumen, *Standley 29355, 29410* (both US). 4 mi W of Chepo, *Tyson 6741* (MO). 2 mi S of Tocumen Airport, *Tyson & Clewell 5875* (MO). VERAGUAS: Valley of Río Dos Bocas, 15.6 km NW of Santa Fe, 450–550 m, *Croat 27647* (MO). Just S of Santa Fe, *Nee 8036* (MO).

15. **Psychotria catillicalyx** Dwyer.[91] TYPE: Panama, *Croat 27548* (MO, holotype).

Trees to 4 m tall, the branchlets angular, smooth, cracking when dry, glabrate, the nodes well spaced. *Leaves* elliptic, 6.5–14.0 cm long, 2.5–5.0 cm wide, deltoid or obtuse toward the apex, acuminate, the acumen to 2 cm long, sometimes falcate, ultimately acute, basally attenuate acute or narrowly cuneate, the costa prominulous on both sides, the lateral veins ca. 9, prominulous, strongly ascending, strict then arcuate, the undulate submarginal vein ca. 2 mm from the margin, the smaller veins inconspicuous, stiffly papyraceous or coriaceous, brown when dry, glabrous; petioles slender, to 2.5 cm long. *Inflorescences* terminal, paniculate, glabrous, to 12 cm long, to 12 cm wide, the peduncle absent, the branches 3, slender, terminating the twiglet, the 2 lateral branches to 8 cm long, often conspicuously arcuate, the median branch with 3–4 pairs of well-spaced opposite branches; bracts and bracteoles deciduous, the flowers moderately congested. *Flowers* pedicellate, the pedicels to 5 mm long, to 0.35 mm wide in the middle, red when dry, glabrous; hypanthium oblong, glabrous, the calycine cup saucer shaped, undulate, to 0.5 mm long, truncate, glabrous, rigid, the teeth absent; corolla white, the tube compressed cylindrical, to 2.5 mm long, to 2 mm wide, glabrous outside, villose within near the filament attachment, carnose, the lobes 5, ca. 2.5 mm long, obtuse, thick, scarcely cucullate; stamens 5, the anthers oblong rotund, ca. 1 mm long, obtuse, the filaments ca. 1 mm long, attached below the mouth; ovarian disc compressed rotund, 1 mm long, black when dry, the style 3.5 mm long, dilated toward the apex, the stigmas 2, narrowly ovate, 1 mm long, ca. 0.25 mm wide, obtuse. *Fruits* (immature) oblong, to 4 mm long, truncate, red when dry, glabrous, ?costate.

Psychotria catillicalyx is known only from Panama. It is distinguished by its saucer-shaped calyx which lacks teeth, its much reduced corolla tube, and the very large compressed rotund ovarian disc.

VERAGUAS: Valley of Río dos Bocas, 11 km from Escuela Agricola Alto Piedra on road to Calovébora, *Croat 27548* (MO).

16. **Psychotria chagrensis** Standley, J. Wash. Acad. Sci. 15: 105. 1925. TYPE: Panama, *Standley 31373* (US, holotype).

Subshrubs 1.0–2.5 m tall, the branchlets terete, smooth, glabrous, usually drying dark. *Leaves* elliptic to elliptic or obovate rotund, 1.5–8.5 cm long, 0.8–3.5 cm wide, deltoid, often somewhat contracted at the apex, acuminate, the acumen short, ultimately acute to obtuse, attenuate acute at the base, the costa prominulous or subplane above, usually subplane beneath, the lateral veins 8–12, well spaced, moderately arcuate, plane above, prominulous beneath, delicately wavy or wrinkled when dry, papyraceous, glabrous, drying olive green above,

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[91] *Psychotria catillicalyx* Dwyer, spec. nov. *Arbores* ad 4 m altae. *Folia* elliptica, 6.5–14.0 cm longa, 2.5–5.0 cm lata, acumine ad 2 cm longo, venis lateralibus ca. 9, papyracea, coriacea; petiolis ad 2.5 cm longis. *Inflorescentiae* terminales, paniculatae, ad 12 cm longae, ad 12 cm latae, pedunculo nullo ramis 3 gracilibus corticem terminantibus. *Flores* cupula calycis catillo simili in margine undulata truncata dentibus nullis; corolla tubo solum 2.5 mm longo, lobis ca. 2.5 mm longis; antheris rotundis ca. 1 mm longis. *Fructus* hic immaturi oblongi, ad 4 mm longi, glabri.

gray or reddish gray beneath, the margin slightly marginate; petioles to 1.5 cm long, wiry, glabrous; stipules connate but often splitting at maturity, narrowly triangular or ovate, 3 mm long or longer, each part terminating in 1 or 2 subulate awns about as long as the body. *Inflorescences* terminal or axillary, the flower mass emerging from an ovate aggregate of bracts, to 1 cm long; bracts to 1 cm long, often with 2–3 irregular lobes, glabrous or ciliate outside, with glands within. *Flowers* sessile, the hypanthium to 1 mm long, glabrous; calycine cup elongate, urceolate, to 4 mm long, scarious, glabrous, eglandular within, the teeth 5, erect, lanceolate, 2.0–3.5 mm long, ca. 1 mm wide at the base, acute; corolla white, the tube cylindrical, 7.5–9.5 mm long, to 1.2 mm wide, glabrous outside, glabrous within except densely villose at the mouth and point of filament attachment, the lobes 5, ovate oblong, 1.8–2.0 mm long, conspicuously galeate, villose basally within; stamens 5, the anthers oblong, 1.3 mm long, the filaments ca. 1.5 mm long, attached ca. 2 mm below the mouth; style included or slightly exserted, to 10.5 mm long, the stigmas small, the ovarian disc compressed rotund, 0.5 mm long. *Fruits* sessile, red, oblong rotund, 6–8 mm long, the pyrenes with 4 grooves on the dorsal face.

Psychotria chagrensis is known from Mexico and most of Central America. The calycine cup and teeth are remarkably elongate for a relatively small flower. The species is readily detected in the herbarium as the slender secondary veins on the lower side of the leaves appear wrinkled. *Gentry & Mori 13916* from Cerro Tacarcuna, 1250–1450 m, has leaves superficially like those of *P. chagrensis* but the inflorescence (in fruit) is patulous in contrast to the highly contracted inflorescence of *P. chagrensis*.

BOCAS DEL TORO: Changuinola forest near Luzon, *Kennedy 3259* (MO). CANAL ZONE: Pipeline Road, 14 mi NE of Gamboa, *Croat 11257* (MO). Chagres, *Fendler 110* (MO). Pina Highlands, Fort Sherman, *Hayden 100* (MO). Maru Towers, NW part of Canal Zone, *Johnston 1551* (MO). Pipeline Road, *Lao et al. 33* (MO). Fort Sherman, Pena Road, *Tyson & Chu 1699* (MO). BARRO COLORADO ISLAND: *Croat 8225, 11150, 14472, 14553, 14643, 14930* (all MO); *Shattuck 1152* (MO); *Woodson & Schery 978* (MO). COCLÉ: 17 km N of El Cope, 900 m, *Folsom 1304* (MO). COLOŃ: Santa Rita Ridge lumber road, *Correa & Dressler 1072* (MO). Río Guanche, *D'Arcy 9681* (MO). Portobelo, *Ebinger 1144* (MO). Santa Rita Ridge, 300–500 m, *Gentry 6600* (MO). Trail S of Río Guanche, ridge Cerro Pan de Azucar, *Mori & Kallunki 2010* (MO). Santa Rita Ridge Road, *Porter et al. 4811* (MO). DARIEŃ: Summit Camp, between Sasardí and Mortí, ca. 400 m, *Duke 10027, 10680* (both MO). Camp Summit, Darién-San Blas border, Sea Canal Route #17, 1000–1200 ft, *Oliver et al. 3691* (MO). PANAMÁ: Cerro Campana, *Correa & Dressler 836* (MO); *Croat 14703, 25208* (both MO). Río Bayano above confluence of Río Chepo, *Duke 3997* (MO). Cerro Campana, *Dwyer & Kirkbride 7869* (GH, MO, US); *Kennedy et al. 2047* (MO); *Kirkbride & Hayden 298* (MO); *Porter et al. 4165* (MO, SCZ, UC, VEN).

17. **Psychotria chiapensis** Standley, Contr. U.S. Natl. Herb. 23: 1390. 1926. TYPE: Mexico, *Purpus 6963* (US, holotype).

Cephaelis tetragona Donnell Smith, Bot. Gaz. 61: 376. 1916. TYPE: Costa Rica, *Tonduz 11352, 12997* (F, holotypes) not *Psychotria tetragona* Seem.

Trees to 30 (40?) m tall, the branchlets terete, smooth, glabrate, often contracted markedly below nodes. *Leaves* oblong, 10–21 cm long, ca. 8 cm wide, tapering acutely at the apex, usually cuspidate, the cusp short, acute or obtuse, acute at the base, vaguely inequilateral, the costa plane to prominulous above, prominent beneath, to 0.15 cm wide proximally, the lateral veins to 13, widely arcuate ascending, the intervenal areas spreading reticulate, submembranaceous

to chartaceous, glabrous; petioles to 2.5 cm long, to 0.15 cm wide; stipules persistent, ovate, 2–4 mm long, the 2 lobes short, broadly obtuse or the apex simply retuse, glabrate outside, villose within, the hairs elongate, appressed, proximal. *Inflorescences* large terminal heads 6–13 cm long, corymbose or cymose, the peduncle 2.5–5.0 cm long, subterete or angular, pubescent, bracts green, large, broad, rounded at the apex, to 7 mm long, to 9 mm wide, ciliolate. *Flowers* with the hypanthium and calycine cup oblong, 5.0–7.5 mm long, cuneate at the base, the hypanthium shorter than the cup, petaloid, glabrous or puberulent, often with several oblong glands at the base of the cup within, ca. 0.3 mm in diam., the calycine teeth absent or 5, deltoid, 1.2–2.0 mm long, corolla white, the tube to 4 cm long, ca. 0.8 mm wide in the middle, often curved, subcrassate, glabrous outside, densely villose in the uppermost ⅓ within, the lobes 5, oblong, 6–9 mm long, ca. 2.5 mm wide, glabrous; stamens 5, the anthers elongate, oblong, to 5.5 mm long, slightly thicker above the middle, versatile, the filaments 0.8–2.2 mm long, slender attached below the mouth; the style slender, 2.5–4.0 cm long, ca. 0.4 mm wide, villosulose above the middle; the 2 stigmas spreading, oblong, to 1.7 mm long; ovarian disc pulvinate, ca. 0.6 mm long. *Fruits* oblong, 1.5–2.0 cm long, 0.8–1.0 cm wide, capped by the persistent calyx, glabrate, the pyrenes 2, the ventral face of the seed plane, the dorsal face 3-costate, the albumen with a T-shaped fissure on the ventral face, the dorsal face entire, triangular in median cross section.

Psychotria chiapensis ranges from Mexico to Peru. It has the longest corolla tubes and the largest fruits among the Panamanian species of *Psychotria*. "Coco Bolito."

BOCAS DEL TORO: Lincoln Creek, *Carleton 86* (F). Cricamola Valley, Almirante, *Cooper 543* (F). Haras San Miguel, N of Concepción, *Folsom 3940* (MO). Changuinola, *Dunlap 17* (F); *Lewis et al. 967* (MO). 10–15 mi S from mouth of Río Changuinola, *Lewis et al. 972* (F, GH, K, MO, NY, UC, US). Chiriquicito, to 5 mi S of Río Guarumo, *Lewis et al. 2106* (MO). Chiriquí Lagoon, Valley of Biarra River, *Seibert 1537* (MO, US). Water Valley, *Wedel 655* (MO), *780, 937* (both G, MO). Chiriquí Lagoon, *Wedel 1071, 1394* (both MO). Garay Creek, *Wedel 2635* (MO). Río Cricamola, between finca St. Louis and Kinkintoe, *Woodson et al. 1917* (MO). CHIRIQUÍ: Cerro Galera Chorcha, *Allen 507* (F). Progreso, *Cooper & Slater 299* (F). SAN BLAS: Inland from airport at Mandinga, *Duke 8924* (MO).

18. **Psychotria chiriquina** Standley, Contr. U.S. Natl. Herb. 18: 129. 1916. TYPE: Panama, *Pittier 3118* (US, holotype; F, isotype).

Shrubs or *trees* 3–8 m tall, the branchlets strongly ascending, smooth, glabrous, the nodes well spaced or occasionally crowded. *Leaves* numerous at the tips of the twigs, elliptic or salicoid, rarely obovate elliptic, 4.5–9.0 cm long, 1–3 cm wide, attenuate toward the apex, acuminate, the acumen to 1.5 cm long, ultimately obtuse, basally cuneate or attenuate acute, the lateral veins 10–12, arcuate, conspicuous and prominulous beneath, the intervenal areas smooth, the ultimate veinlets often evanescent, the margin usually lightly revolute, subcoriaceous to stiffly chartaceous, concolorous or discolorous, often drying red, glabrate; petioles to 1.5 cm long; stipules deciduous or persistent, connate at the base, the free portions oblong, to 1.2 cm long, usually retuse at the apex, the 2 awns short, obtuse, stiff, glabrescent. *Inflorescences* terminal, glabrous to minutely pubescent, cymose paniculate, to 12 cm long, to 9 cm wide, the peduncle

absent or to 8 cm long, the branches few, opposite; bracts ovate, to 1 mm long, deciduous, pedicels slender, rigid, 2–5 mm long. *Flowers* with hypanthium short, puberulent, the calycine cup scarcely measurable, the teeth either obsolete or widely triangular, to 1 mm long; corolla white, the tube funnelform, 3–5 mm long, puberulent outside, densely barbate below the mouth within, the lobes 5, oblong, to 2.5 mm long, stiff, lightly cucullate; stamens 5, the anthers oblong, ca. 1 mm long on short filaments attached near the middle of the tube; style slender, glabrous. *Fruits* oblong rotund to rotund, ca. 0.6 mm long, drying dark, sulcate, glabrous.

Psychotria chiriquina is known only from Panama.

CHIRIQUÍ: Cerro Punta, 700 m, *Croat 26342* (MO). Las Nubes, *Croat 26450* (MO). Cerro Punta, ca. 6500 m, *Folsom et al. 2079* (MO). Cerro Horqueta, *Hagen & Hagen 2024* (NY). Alto de la Cuesta, E slope of Chiriquí Volcano, 2100–2200 m, *Pittier 3118* (F, US). 6 mi above Cerro Punta, Boquete Trail, ca. 7000 ft, *Tyson 7078* (MO). 6 mi E of Cerro Punta on the Boquete Trail, ca. 7000 ft, *Tyson 7206* (MO).

19. **Psychotria chloritica** Muell.-Arg., Flora 59: 545. 1876. LECTOTYPE: Brazil, *Blanchet 908*. Not seen.

P. chloritica β. *bahiensis* Muell.-Arg., Flora 59: 545. 1872.
Uragoga chloritica (Muell.-Arg.) Kuntze, Rev. Gen. Pl. 2: 960. 1891.

Shrubs or *trees*, the branchlets slender, smooth, glabrous, the nodes well spaced. *Leaves* lanceolate or oblong, 12–23 cm long, 5.5–11.0 cm wide, the costa prominulous above, prominent beneath, acute or deltoid, acuminate, the acumen widely triangular to subcaudate, to 2 cm long, basally attenuate or acute, the lateral veins ca. 18, arcuate, the smaller veins between a pair of lateral veins 2–4, soon evanescent, stiffly papyraceous, concolorous, glabrous, the raphides on the lower surface dense, inconspicuous, ca. 0.5 mm long; petioles 1.0–2.3 cm long, 0.15 cm wide, glabrous; stipules deciduous, free, erect, oblong, to 3.2 cm long, to 0.6 cm wide, the 2 awns equal or somewhat unequal, as long as or longer than the body, acute, scarious, glabrous. *Inflorescences* terminal, solitary, cymose paniculate, to 11.5 cm long, to 9 cm wide, the flowers disposed in a mass at the end of each branch, the mass to 2 cm long, apparently often wider than long, the peduncle slender, rigid, to 10 cm long, 0.25 cm wide, puberulent, the branches opposite or subopposite, the lowermost to 3 cm long, longer than the rachis, the lowermost bracts subulate or narrowly oblong, to 2 cm long, 0.2–4.2 cm wide, acute, glabrous, ciliolate venose. *Flowers* sessile; hypanthium short, glabrous, the calycine cup short, turgid, 0.3 mm long, the margin erosulose, the teeth inconspicuous or distinctly triangular and to 0.5 mm long; corolla white, the tube tubular, to 4 mm long, expanded at the apex, glabrous outside and in, the lobes narrowly triangular, to 2.2 mm long, ciliolate; anthers linear oblong, ca. 2 mm long, the filaments ca. 1.2 mm long, attached above the middle of the tube; style ca. 5 mm long, the stigmas minute. *Fruits* sessile, rotund, 5 mm long, glabrous, drying black, ?glaucous, conspicuously obtuse costate, the grooves deep, the calycine cup evanescent.

Psychotria chloritica is known from Panama, Colombia, Brazil and Peru. The general appearance of the plant suggests *P. lupulina* Benth. which has much

shorter stipules and a much more contracted inflorescence and bracts and bracteoles with greater complexity of arrangement.

Duke 9597 notes that the bracts and stipules are maroon. *Dwyer 2249* records the fruit as 'glaucous, pink red.'

Müller (= Muell.-Arg.) first refers to *P. chloritica* in A Key to *Psychotria,* followed by a number in parenthesis (207). Following the key, under the entry 207, he lists 3 taxa: *P. chloritica* α. *obovata*; β. *bahiensis*; γ. *lanceolata*. No typical "variety" is listed. In view of this, I am selecting β. *bahiensis* as the lectotype of the species and *Blanchet 908* from Bahia, Brazil, as the type.

DARIÉN: Puerto Sta. Dorotea, Cocolito, *Dwyer 2225, 2249* (both MO). COLOMBIA: CHOCO: Between Río Curiche and Alto Curiche, *Duke 9598* (MO). Near Madurex Logging Camp above Teresita and below rapids, Río Truando, *Duke 9921* (MO).

20. **Psychotria cincta** Standley, Field Mus. Nat. Hist., Bot. Ser. 7: 90. 1930. TYPE: Colombia, *Killip 5140* (US, holotype).

Shrubs or small *trees* to 4 m tall, the branchlets slender, subterete, the nodes well spaced. *Leaves* elliptic or oblong, 14–18 cm long, 3–7 cm wide, deltoid at the apex, acuminate, the acumen to 1.5 cm long, ca. 1.5 mm wide in the middle, basally acute, obtuse or cuneate, slightly inequilateral, the costa slender, prominulous above and beneath, the lateral veins ca. 14, strict then arcuate, the venules spreading reticulate, the margins callose marginate, ca. 0.15 mm wide, coriaceous, glabrous; petioles slender, 6–15 mm long, glabrous; stipules persistent, connate, the sheath to 4 mm long, truncate, each part with 2 rigid, subulate awns, 7–15 mm long. *Inflorescences* terminal, 7–20 cm long, thrysoid paniculate, the peduncles slender, rigid or flexuous, 7–12 cm long, 0.6–1.0 mm wide, the rachis minutely hirtellous or glabrate, the primary branches well spaced, short, alternate, strict or somewhat recurved, the flowers disposed in subsecund and sessile cymules. *Flowers* sessile; hypanthium subrotund, ca. 0.5 mm long, densely pubescent, the teeth of the short calycine cup obscure; corolla tube narrowly cylindrical, ca. 3 mm long, puberulent inside and out, the lobes 5, ovate oblong, ca. 1 mm long; stamens 5, the anthers oblong, 1.5 mm long, the filaments 1 mm long; style 2.5 mm long, dilated above, the stigmas 0.5 mm long. *Fruits* subrotund, ca. 4.5 mm in diam., obscurely costate, glabrous.

Psychotria cincta occurs in Panama and Colombia. It is distinguished from other Panama species of *Psychotria* by a combination of elongate inflorescence and leaves which are conspicuously callose marginate. The inflorescence is rarely pendent (*Mori & Kallunki 4563*).

BOCAS DEL TORO: Punta Pena, Chiriquicito, *Lewis et al. 2168* (GH, MO, US). Fish Creek, Chiriquí Lagoon, *Wedel 2233* (MO). COLÓN: Meteorological Station at Agua Clara and Puerto Pilon, *Correa & Dressler 1193* (MO). Santa Rita Ridge, *Croat 14140* (MO). Santa Rita Ridge, ca. 1 mi from Boyd-Roosevelt Highway, *Croat 15324* (MO). 8 mi E of Santa Rita Ridge, *Dwyer et al. 8984* (MO). 10 mi SW of Portobelo, *Liesner 1060* (MO). Santa Rita Ridge, 1.9 km from Boyd-Roosevelt Highway, *Mori & Kallunki 1806* (MO). Santa Rita Ridge, ca. 10 mi from highway, *Porter et al. 4761, 4816* (both MO). PANAMÁ: Road from El Llano to Cartí-Tupile, 12–16 mi above Panamerican Highway, *Croat 22892, 25133* (both MO). El Llano to Cartí Road, 14.9 km N of Panamerican Highway, 350–500 m, *Folsom et al. 1451* (MO). Just W of El Llano and 4.8 mi N of highway, *Gentry 5093* (MO). El Llano Carti-Tupile Road, 16 mi above Panamerican Highway, *Kennedy et al. 2431* (MO). Altos del Río Pacora, *Lewis et al. 2286* (GH, MO, US). El Llano Cartí-Tupile Road, 12 mi above Panamerican Highway,

FIGURE 71. *Psychotria cooperi* Standley.—A. Habit (×½).—B. Flowers, one opened to show part of interior (×3). [After *Mori & Kallunki 3118.*]

Liesner 1226 (MO). El Llano-Cartí Road, 18 km from Panamerican Highway, 350 m, *Mori et al. 4563* (MO). El Llano-Cartí Road, 16–18½ km N of Panamerican Highway, 400–500 m, *Nee & Tyson 10938* (MO). SAN BLAS: El Llano to Cartí-Tupile, Continental Divide, *Folsom 2593* (MO); *Kennedy 2582* (MO). VERAGUAS: Mouth of Río Concepción, *Lewis et al. 2770* (MO).

21. **Psychotria cooperi** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 296. 1929. TYPE: Panama, *Cooper 577* (F, holotype; NY, isotype)—FIG. 71.

Trees or *shrubs*, 2–10 m tall, the branchlets angular, smooth, glabrous, the nodes well spaced, swollen with persistent stipules. *Leaves* oblong, to 12.5 cm long, to 6 cm wide, tapering obtusely, cuspidate, the cusp when elongate slender, to 1.8 cm long, falcate, cuneate to obtuse at the base, the costa prominulous above, subplane beneath, the lateral veins 10–15, strongly arcuate, plane to prominulous above, prominulous beneath, the subparallel veins between pairs of lateral veins evanescent, the intervenal areas spreading reticulate, somewhat evanescent above, villosulose on the costa and on some veins beneath, slightly marginate, stiffly chartaceous to membranous, discolorous, glabrous except the costa and larger veins; petioles to 2.8 cm long, to 0.15 cm wide; stipules persistent, ?connate at base, oblong, 1.0–1.2 cm long, 0.9 cm wide, bilobed, the 2 lobes obtuse, much shorter than the sheath, marginally villose, at first scarious then becoming woody, glabrous. *Inflorescences* terminal or axillary, hemispherical or oblong rotund, to 3 cm long, to 3.8 cm wide, at anthesis presumably erupting from the enveloping terminal stipule, the peduncle less than 1 cm long, with 4–5 radiate branches, these slender or stout, to 1(–2) cm long, angular, glabrous; bracts few, large, involucrate, compressed rotund, the outer to 5.5 mm long, to 7 mm wide, petaloid, glabrous, venose, the margin undulate or shallow retuse, each bract with 2 patches of subulate glands, each patch to 2 mm long, purple, with ca. 20 glands. *Flowers* few, the pedicels usually fleshy, glandular, glabrous, 1.0–1.8 mm long, often wider than the short hypanthium, the calycine cup chaliciform, 0.3–1.0 mm long, glabrous, carnose, eglandular within, the teeth 5, triangular, to 1 mm long, subequal or obviously unequal; corolla white, cylindrical, to 4.2 mm long, carnose, glabrous outside, densely villose within on the upper ⅔, the lobes 5, ovate oblong, to 2.5 mm long; stamens 5, style to 5 mm long, often hidden in the hairs of the tube, the anthers narrowly oblong, 1.5–2.0 mm long, vaguely apiculate, the filaments short, attached near the middle of the tube; stigmas 2, short, obtuse, the ovarian disc annular or hemispherical, 0.3–1.0 mm high. *Fruits* turbinate, to 1(–1.5) cm long, capped by a cylindrical calyx, the 5 lobes scarcely evident or to 0.35 cm long, narrowly oblong; pyrenes black, conspicuously costate outside, the endocarps with a large basal pore; pedicels to 3 mm long.

Psychotria cooperi is known only from Panama and Colombia. *Forero 734* lists the corolla color as "lila"; perhaps he is referring to the bracts. "Cocobolito."

COCLÉ: Cerro Caracoral, *Duke & Dwyer 1576* (MO). Cerro Pilón, *Dwyer & Lallathin 8684* (MO). Cerro Caracoral, *Kirkbride 1092* (MO). VERAGUAS: 5 mi NW of Santa Fé, *Liesner 957* (MO). 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3118* (MO). NW of Santa Fé, 11 km from Escuela Agricola de Piedra, Valley of Río Dos Bocas, *Mori et al. 3873* (MO). 7 mi W of Santa Fé, 2900 ft, *Nee 11209* (MO). COLOMBIA: CHOCO: Río Curiche and Alto Curiche, *Duke 9589* (MO). Región Del Río Pichima Communidad Indígena Waunana, *Forero 734* (MO). Carretera Ansermanuevo—San Jose del Palmar, Alto del Galápago, 2000 m, *Forero et al. 2908* (MO).

22. **Psychotria copensis** Dwyer.[92] TYPE: Panama, *Folsom & Lantz 1880* (MO, holotype).

Shrubs to 2 m tall, the branchlets terete, perhaps glabrous, the pith area ample, porose. *Leaves* lanceolate, 21–25 cm long, 4–10 cm wide, obtuse or rounded toward the apex, acuminate, the acumen to 1.5 cm long, obtuse to acute at the base, the costa plane or immersed above, subprominent beneath, the lateral veins 20–25, arcuate, not forming a distinct marginal vein, with usually one smaller subparallel vein between 2 lateral veins, this reaching almost to the margin before evanescing by branching, stiffly chartaceous, subconcolorous, drying dark, glabrous above except pubescent especially on the costa and the veins, golden villosulose on the costa and the veins beneath; petioles to 2.5 cm long, stout, to 0.3 cm wide, webby villose, the hairs matted, often deciduous; stipules free, tending to persist at the twiglet tips, compressed oblong, to 1.3 cm long, to 1.6 cm broad, the body ca. 5 mm long with 2 oblong lobes, to 8 mm long, to 5 mm wide, obtuse, the margin erose, sublignose, outside densely appressed villose, the hairs golden, often aggregates of hairs flabellately disposed, glabrous within except at the base where soft white hairs are dense and interspersed with numerous stiff, dark red spikelike glands to 2 mm long. *Inflorescence* terminal, cymose paniculate, to 11 cm long, to 12 cm wide at base, densely golden villose, with 3 axes terminating the twiglet, each with peduncle ca. 3 cm long, the 2 shorter axes terminated by 3–4 primary branches, the longest axis obviously dominant, with a whorl of 4 basal branches and a well spaced upper whorl, the branchlets of these few, the cymes few; bracts of lowermost branches persistent, oblong, to 0.4 cm long, densely golden villose outside, glabrous within, partially enveloping the branch base, the bracts and bracteoles becoming progressively smaller and triangular. *Flowers* (in bud) sessile or subsessile; hypanthium rotund, ca. 1 mm long, pubescent, the calycine cup petaloid, ca. 0.5 mm long, saucer shaped, the teeth 5, triangular, to 1.5 mm long, acute, puberulent outside; corolla white, to 12 mm long, thickly carnose, densely white villose, densely white villose within ca. 4 mm above base, the corolla lobes oblong, about ¼ length of the tube, thickly carnose, the lower ⅓ densely villose within; stamens 5, the anthers oblong, to 4 mm long, minutely apiculate, dorsifixed, the filaments slender, ca. 2 mm long, attached near the mouth; ovarian disc ca. 0.8 mm long; style filamentous, to 10 mm long, the stigmas 2, ca. 1.2 mm long, each scarcely wider than the style. *Fruits* sessile or pedicellate for 3 mm, oblong, to 7 mm long, drying black, puberulent, costate, the persistent calyx to 2 mm long.

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[92] *Psychotria copensis* Dwyer, spec. nov. *Frutices* ad 2 m alti. *Folia* lanceolata, 21–25 cm longa, 4–10 cm lata, ad apicem obtusa vel rotundata, acumine ad 1.5 cm longo, venis lateralibus 20–25, rigido-chartacea subconcoloria supra glabra praeter costam venasque pubescentia subtus aureo-villosulosa; petiolis lignosis ad 2.5 cm longis arachnoideo-villosis. *Inflorescentiae* terminales cymoso-paniculatae, ad 11 cm longae, ad 12 cm latae, dense aureo-villosae, pedunculo uno fortasse non evoluto sed apice ramuli 3 pedunculis terminato; bracteis inferioribus persistentibus oblongis, ad 0.4 cm longis. *Flores* hypanthio ca. 1 mm longo, cupula calycis catilliformi dentibus 5 triangularibus, ad 1.5 mm longis extus puberulis; corolla alba tubo et lobis ca. 12 mm longis, crasso-petaloideo extus dense villosa, intus dense villosa supra basin; antheris oblongis, ca. 4.2 mm longis, filamentis ca. 2 mm longis prope faucem affixis; stylo ca. 10 mm longo, stigmatibus gracilibus. *Fructus* oblongi, ad 7 mm longi, puberuli costati in sicco nigri calyce ad 2 mm longo.

The new species is known only from Panama and is named after El Cope, the site of the type collection. Considering it is a *Psychotria* only 2 meters tall and with a terminal inflorescence, it has exceptionally large leaves. In *Psychotria* of the New World, a combination of short stature and large leaves are associated usually with axillary inflorescences, e.g., *P. uliginosa* Swartz. The persistent stipules are remarkably coriaceous and large, being wider than long. The admixture of many soft white hairs with numerous subulate rigid glands at the base of the stipules on the inside is noteworthy. Each stipule has 2 gross and obtuse lobes, in this respect differing from the other Panama species. The corolla, seen only in bud, is among the largest of the Panamanian species. The corolla is strongly carnose; unfortunately no data are given as to flower color, although predictably it is white. The saucerlike shape of the calyx with its strongly dentate margin is noteworthy.

COCLÉ: El Copé, El Petroso; first bottom of ridge after 3 small dips; Atlantic slope of Alto Calvario, *Folsom & Lantz 1880* (MO).

23. **Psychotria copeyana** Standley & Williams, Ceiba 1: 251. 1951. TYPE: Costa Rica, *Williams & Allen 16482* (F, holotype)

Small *trees* 2–6 m tall, the ultimate branchlets angular, smooth, white pubescent, the nodes well spaced. *Leaves* narrowly elliptic or obovate elliptic, 3.5–11.0 cm long, 2–3 cm wide, obtuse toward the apex, abruptly acuminate, the acumen slender, often falcate, 0.5–1.0 cm long, the costa prominulous, the lateral veins 15, crowded, arcuate, the intermediate 1–2 veins between pairs of lateral veins much more slender than the lateral veins, bifurcating near the margin, the smaller veins pinnatiform, stiffly papyraceous, dark brown, glabrous and shiny above, green brown and pubescent beneath; petioles slender but rigid, 0.5–1.0 cm long, 0.7 mm wide, glabrous; stipules connate, to 7 mm long, each part with 2 short, obtuse, terminal lobes, ca. 0.6 mm long. *Inflorescences* terminal, solitary, somewhat hemispherical, paniculate, to 15 cm long, to 15 cm wide, minutely puberulent; peduncle to 3.5 cm long, the first pair of branches opposite, rigid, to 6.5 cm long, the upper branches opposite, spreading, well spaced, the secondary branches branching, angular ascending, the cymes spreading; bracts linear oblong, to 1.3 cm long, to 0.2 cm wide; pedicels short. *Flowers* with the hypanthium ca. 1 mm long, smooth, the calycine cup short, glabrous, the lobes 5, oblong, longer than the hypanthium, 1.7 mm long, reflexed, obtuse, glabrous with 1–4 minute glands at the base of adjacent lobes; corolla yellow, the tube cylindrical, to 6 mm long, turgid at the base, carnose, glabrous outside with curled elongate hairs within near the anthers, the lobes 5, narrowly oblong, to 3.2 mm long, obtuse, ultimately reflexed; stamens 5, the anthers narrowly oblong, 2.2 mm long, dorsifixed, obtuse, the filaments short, slender, 1 mm long, attached above the middle of the tube; ovarian disc oblong, 1 mm long, truncate at the apex, the style slender, 7 mm long, the stigmas 2, minute. *Fruits* blue, oblong, ca. 5 mm long, rounded at the apex and the base, glabrous, minutely rugulose, 10-sulcate; calycine cup persistent, conspicuous, the lobes reflexed.

Psychotria copeyana is known from Costa Rica and Panama. It is distinguished by its many-veined leaves which beneath, at least in their dry state, often

have the general appearance of those of *Blepharodon mucronatum* (Schlt.) Dcne. of the Asclepiadaceae. The yellow flowers with calycine lobes elongate and with glands at the base are noteworthy. The leaves of *P. copeyana* also bear a striking resemblance to those of *Palicourea montivaga* Standley. *Mori et al. 7850* and *Sullivan 383* (MO, both from Cerro Tute, Prov. Veraguas, and not cited below) may be *P. copeyana*; the leaves have fewer lateral veins than the collections cited below and the fruit is considerably smaller. In addition, each part of the connate stipules is briefly bicornuate.

CHIRIQUÍ: Cerro Colorado, 1500 m, *Folsom & Collins 1749* (MO). Cerro Punta, ca. 2000 m, *Gentry 5872* (MO). N of San Félix, Chiriquí-Bocas del Toro border, Cerro Colorado Copper Mine Road, 5000–5500 ft, *Mori & Kallunki 5887* (MO). VERAGUAS: Cerro Tute, cloud forest above 1000 m, *Mori 6762* (MO, US); *Mori et al. 7591* (MO, US).

24. **Psychotria croceovenosa** Dwyer.[93] TYPE: Panama, *Mori & Kallunki 5880* (MO, holotype).

Trees 5–8 m tall, the twiglets terete, ultimately angular and twisted, smooth, minutely puberulent, the nodes well spaced. *Leaves* ovate to ovate oblong, 5–16 cm long, 3.5–8.2 cm wide, acute or deltoid at the apex, obtuse or subtruncate at the base, conspicuously or scarcely inequilateral at the base, the costa plane or immersed above, scarcely prominent beneath, darker than the blade, the lateral veins 10–12, arcuate, often widely so, prominulous, the undulate submarginal vein close to the margin, the smaller veins pinnatiform, drying immersed and appearing pellucid red when held to light and magnified, chartaceous, conspicuously discolorous, dark red brown above, tan beneath, minutely farinose above, puberulent beneath; petioles wiry, stiff, often curved, to 4 cm long, puberulent, drying dark; stipules deciduous, occasionally persistent, connate, turgid, cup shaped, to 4 mm long, the margin delicately glandular marginate. *Inflorescence* terminal, cymose pyramidal paniculate or ovate triangular, to 14 cm long, to 10 cm wide, apparently with 3 peduncles terminating the twiglet, the peduncles to 4.5 cm long, to 0.22 cm wide, drying purple black, densely white puberulent, the lowermost branches of the rachis opposite, subarcuate, plano compressed, unbranched to almost the middle, then with 3–4 pairs of opposite or secondary branches, these slender, well spaced, to 6 cm long, ascending, the lowermost opposite, the upper branches opposite or alternate, much shorter, the cymules few flowered, the bracts subulate or narrowly ovate lanceolate, to 4 mm long, persistent at the bases of the primary, secondary and tertiary branches. *Flowers* sessile or subsessile, the calycine cup and teeth ca. 1 mm long, petaloid, eglandular within, the lobes 5, widely triangular, ½ the length of the cup or longer, puberulent on the back; corolla tube cylindrical, to 3.5 mm long, to 1.5 mm wide, petaloid, the lobes 5, oblong, to 1.5 mm long, obtuse, cucullate in bud; anthers

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[93] *Psychotria croceovenosa* Dwyer, spec. nov. *Arbores* ad 8 m altae ramulis minuto-puberulis. *Folia* ovata ad ovato-oblonga, 5–16 cm longa, 3.5–8.2 cm lata, apice acuta vel deltoidea basi saepe subtruncata venis lateralibus 10–12 venis minoribus pellucido-rubris, chartacea subtus puberula; petiolis ad 4 cm longis; stipulis connatis cupuliformibus ad 4 cm longis. *Inflorescentiae* terminales, ad 14 cm longae, ad 10 cm latae. *Flores* cupula calycis et dentibus ca. 1 mm longis, extus puberulis; corolla tubo cylindrico turgido, ad 3.5 mm longo, lobis ca. 1.5 mm longis, obtusis; antheris ca. 1.3 mm longis; stylo ca. 4 mm longo. *Fructus* non visi.

linear oblong, to 1.3 mm long, obtuse, subversatile, the filaments much shorter than the anthers, inserted above the middle of the tube and adnate as linelike structures extending from point of attachment to the base of the tube; style slender, ca. 4 mm long, the stigmas minute, ca. 0.3 mm long; ovarian disc compressed globose, ca. 1 mm long, drying black, with a craterlike depression at the apex. *Fruits* not seen.

Psychotria croceovenosa is known only from Panama. Its most diagnostic feature is the watery red smaller veins of the leaf blades as seen in dried material. The name *croceovenosa* suggests this. The new species bears some resemblance to *P. luxurians* Rusby but differs in having much smaller leaves which are ovate to ovate oblong in shape. The stipules are connate while those of Rusby's species are free.

CHIRIQUÍ: N of San Félix at Chiriquí-Bocas del Toro border, Cerro Colorado copper mine road along continental divide, 5000–5500 ft, *Mori & Kallunki 5880* (MO).

25. **Psychotria davidsei** Dwyer.[94] TYPE: Panama, *Gentry & Mori 14071* (MO, holotype).

Subshrubs to 1.5 m tall, the branchlets slender, straw colored, puberulent, the nodes well spaced. *Leaves* elliptic oblong, 5.0–11.5 cm long, 2.3–4.0 cm wide, acuminate, the acumen narrowly triangular, to 1.5 cm long, acute, basally acute or cuneate, often inequilateral, the costa prominulous above and beneath, the lateral veins ca. 20, arcuate with a smaller vein between a pair of lateral veins, this branching ⅔ of the way to the margin, the intervenal areas spreading reticulate, the marginal vein ca. 1 mm from the margin, chartaceous, discolorous, dark green above when dry, glabrous above, puberulent beneath; petioles slender, to 3 cm long, 0.1 cm wide, puberulent; stipules crowded toward the apices of the twiglets, connate, the sheath cylindrical, 4 mm long, each part with 2 elongate lance subulate lobes, to 14 mm long, acute, glabrous, scarious, membranous, glabrous outside, within with raised areas of dense weak white hairs. *Inflorescences* terminal, often solitary, usually paniculate, to 6.5 cm long, to 4 cm wide, rarely epedunculate, the peduncle when present 1.0–2.5 cm long, 0.1 cm wide, glabrous, terminated by a mass of flowers or the rachis with 1–2 opposite branches to 2 cm long, the heads few flowered, the bracts few, involucrate, spreading, lanceolate, to 2 mm long, glabrous, acute. *Flowers* sessile; hypanthium ca. 0.5 mm long, glabrous with about 10 oblong or subulate glands (?) on the outside, these ca. 0.2 mm long, the calycine cup cupuliform, 0.5 mm long, petaloid, glabrous, the lobes 5, triangularly oblong or ovate oblong, 1.3–3.8 mm long, glabrous, petaloid, 5; corolla white, the tube cylindrical, 6.5–7.5 mm long, 1.5

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[94] *Psychotria davidsei* Dwyer, spec. nov. *Suffrutices* ad 1.5 m alti. *Folia* elliptico-oblonga, 5.0–11.5 cm longa, 2.3–4.0 cm lata, venis lateralibus ca. 20, chartacea supra glabra infra puberula; petiolis ad 3 cm longis; stipulis versus apicem ramulorum confertis connatis vagina ca. 4 mm longa, parte utraque lobis 2, ad 14 mm longis, glabris extus intus areabus elevatis ciliorum crebrorum debilium ornata. *Inflorescentiae* ad 6.5 cm longae, caespitibus paucifloris. *Flores* hypanthio glandulis 10, ca. 0.2 mm longis, dentibus calycis 5 inaequalibus, 1.3–3.8 mm longis; corolla tubo 6.5–7.5 mm longo extus glabro; antheris ca. 1.2 mm longis. *Fructus* sessiles oblongi, ad 0.6 cm longi, glabri.

mm wide, glabrous outside, scarcely turgid at the apex, stiffly petaloid, the lobes 5, triangularly oblong or ovate oblong, 2.0–2.5 mm long, glabrous; stamens 5, included, the anthers oblong, 1.2 mm long, the filaments slender, 0.2 mm long, attached ca. 1.5 mm below the mouth; style slender, 6.5 mm long, the stigmas 2, narrowly oblong, 0.5 mm long. *Fruits* sessile, oblong, to 0.6 cm long, glabrous, costate, blue, the calycine cup and the teeth persistent, to 1.5 mm long.

Psychotria davidsei is known only from Panama. It is named in honor of Gerrit Davidse distinguished plant collector and student of the flora of Central and South America. The new species has 2 outstanding diagnostic features: conspicuous padlike masses of hairs within the stipules and glandular or glandlike markings on the outside of the calycine cup.

DARIÉN: Cerro Tacarcuna, summit camp along stream N of camp, lower montane wet forest life zone, 1550–1650 m, *Gentry & Mori 14071* (MO).

26. **Psychotria deflexa** DC., Prodr. 4: 510. 1830. TYPE: Surinam, Collector unknown (MO, photo of isotype (?) in Delessert Herb.).

Psychotria patens of auth., not Swartz,
P. flexuosa of auth., not Willd.,

Shrubs to 2 m tall, ultimately angular, smooth, glabrous, the nodes well spaced, usually 3.5–14.0 cm apart. *Leaves* oblong lanceolate or ovate lanceolate, (4.5–)8.0–14.0 cm long, 1.0–5.5 cm wide, acute or rarely tapering obtusely, with a vague, often falcate, rounded acumen, to 2 cm long, obtuse or cuneate at the base, often slightly inequilateral, the costa slender, prominulous or plane above, plane beneath, the lateral veins 6–9, with 1–4 irregular and soon branching smaller veins between a pair of lateral veins, the secondary veins pinnatiform, stiffly chartaceous, concolorous, drying green or occasionally brown, glabrous; petioles 0.5–1.0 cm long, glabrous, the lamina slightly decurrent adaxially; stipules connate, to 9 mm long, the sheath 1–2 mm long, truncate, the awns 2 per part, subulate, 2–7 mm long, acute, occasionally puberulent. *Inflorescences* terminal, solitary, glabrous or puberulent, often narrowly oblong, 8–15 cm long, 3–4(–8) cm wide, the peduncles 3–7 cm long, slender, occasionally flexuous, to 0.8 mm wide, the branches short, numerous, opposite or alternate, strict or arcuate, occasionally deflexed, the lowermost to 3 cm long, the branchlets few, often zigzag. *Flowers* sessile or pedicellate; hypanthium 0.5 mm long, glabrous or puberulent, the calycine cup short, 0.15 mm long with several minute, appressed glands within, the lobes 5, triangular, 0.3 mm long; corolla white, the tube cylindrical, 3 mm long, expanded near the mouth, puberulent outside, villose within above the filament attachment, the lobes 5, oblong, 0.5 mm long, obtuse or acute; stamens 5, included or exserted, the anthers oblong, 0.7 mm long, the filaments slightly unequal, 1.5 mm long, attached in the upper ⅔ of the tube; ovarian disc annular, 0.25 mm wide, the styles of 2 lengths, 2.0–3.5 mm long, the stigmas oblong, 0.35–1.00 mm long. *Fruits* didymous, each pyrene rotund, to 3 mm in diam., drying green or black, the dorsal face somewhat costate, the ventral face of the endocarp with a groove.

Psychotria deflexa is a common species in the lowlands of tropical America. It has often been filed in herbaria under *P. patens* Swartz.

BOCAS DEL TORO: Between Buena Vista Coffee Finca and Cerro Pilón, *Kirkbride & Duke 686* (F, MO), *711* (MO). Fish Creek, *Wedel 2216* (MO). CANAL ZONE: Juan Mina, *Bartlett & Lasser 16564* (MO). Between Fort Sherman and Fort Lorenzo, *Croat 15413* (MO). Coco Solo weather station, *Duke 4271* (MO). K-6 Road, *Dwyer 3025* (MO). Coco Solo, *Dwyer & Duke 7870* (GH, MO, UC, US). George Greene Memorial, Madden Forest, *Dwyer & Hayden 12* (MO). Coco Solo, *Gentry 6070* (MO). Mandingo Road near Empire, *Hayden 514* (MO). Pipeline Road, *Mori & Kallunki 2414* (MO). Gaillard Highway, 2 km NW of Summit Gardens, *Nee 7445* (MO). Splice S16 and S49, Río Indio, *Steyermark & Allen 17453* (MO). 1 mi N of Summit Garden, *Tyson & Blum 1966* (MO). Pipeline Road, *Witherspoon & Witherspoon 8627* (MO). BARRO COLORADO ISLAND: *Aviles 47* (MO); *Croat 4042* (F, MO), *4146, 5931, 6191, 6257, 6395, 6420, 6620, 6650, 8094, 10348, 10843, 10844, 10972* (all MO), *11093* (F, MO), *11135, 11926, 11995, 15587* (all MO); *Ebinger 18, 183* (both MO); *Hayden 27, 31, 130* (all MO); *Killip 39964* (MO); *Shattuck 627, 931* (both MO); *Starry 169, 322* (both MO); *Tyson & Blum 1961* (MO). COCLÉ: Cerro Pilón, *Croat 13450* (MO). El Valle, *Dwyer & Correa 7972* (MO). DARIÉN: Río Yapé, *Bristan 1385* (MO). Without other locality, *Duke 8334* (MO). Confluence of Río Balsa and Río Areti, *Duke 8742* (MO). Mortí Hydro, Río Mortí, *Duke 15821* (MO). Between Paya and Palo de los Letras, *Duke & Kirkbride 14031* (F, MO). Río Tuquesa, Tuquesa Mining Camp, "Charco Chiva," *Mori 6989* (MO). Río Tuquesa, middle Tuquesa Mining Co. camp "Charco Peje," *Mori 7016* (MO). Caná, *Stern et al. 521, 695* (both MO). Campamento Buena Vista, *Stern et al. 909* (MO). Periaque Hill near Río Sabana and Río Lara, *Tyson 4729* (MO). 3 mi E of Santa Fé, *Tyson et al. 4695* (MO). Pipeline Road, 5.3 km from entrance, *Witherspoon & Witherspoon 8627* (MO). HERRERA: Between Las Minas and Pesé, *Duke 12344* (MO). PANAMÁ: Río la Maestra, *Allen 37* (MO). Cerro Jefe, *Croat 13042* (MO); *D'Arcy & D'Arcy 6243* (MO). Río Pita near confluence with Río Maestra, *Duke 4765* (MO). Midway between El Llano and Río Mamoni, *Duke 5595* (MO). Piriá-Cañasas Trail near Piriá, *Duke 14351* (MO). Cerro Azul, *Dwyer 1375, 2055* (both MO). Goofy Lake to ca. 8 mi S, *Dwyer 7101* (MO). Cerro Jefe, *Dwyer & Gauger 7393* (GH, MO). Goofy Lake to 1.5 mi S, *Dwyer & Hayden 8025* (GH, MO, UC, US). Cerro Campana, *Dwyer et al. 4720* (MO, SCZ), *7815* (MO, UC). Río Maestro, *Gentry 2216* (F, MO). Cerro Jefe, *Gentry 6787* (F, MO). Fort San Lorenzo, *Hayden 111* (MO). San José Island, *Johnston 49* (MO). Cerro Campana, *Kirkbride & Hayden 296* (F, MO). Cerro Campana, *Lewis et al. 3068* (MO, UC). Chimán, *Lewis et al. 3255* (MO, UC). Cerro Campana, *McDaniel 6911* (MO). 6.5 km by road N of Lago Cerro Azul, *Nee 9307* (MO). 1 mi N of Goofy Lake, *Oliver et al. 2673* (COL, DUKE, K, MO, NY, UC, VEN). Cerro Azul, *Tyson 2112, 4320* (both MO). SAN BLAS: E of Cangandí-Mandinga Road, *Duke 14760* (MO), *14762* (MO, OH). Río Diabolo and Río Acuati near Nargana, *Duke 14883* (MO). Ailigandi, *Dwyer 6836, 6850* (both MO). Headwaters of Río Mulatupo, *Elias 1730* (GH, MO, US). Playon Chico, *Gentry 6393* (MO). 3–4 hours up Río Mulutupu, *Kirkbride 227* (MO). VERAGUAS: Isla de Coiba, *Dwyer 2320* (MO). Cerro de Tuté, *Dwyer 4846* (MO). 3.9–5.0 m N of Santa Fé, *Gentry 2973* (MO).

27. **Psychotria dosbocensis** Dwyer.[95] TYPE: Panama, *Croat 27427* (MO, holotype).

Shrubs to 1.2 m tall, the stems terete, somewhat twisted when dry, smooth, black, golden puberulent, the nodes not turgid, well spaced. *Leaves* oblong, to 30 cm long, to 18 cm wide, obtuse or rounded toward the apex, acuminate, the acumen perhaps short, basally widely cuneate, the costa prominulous above, occasionally immersed, prominent and convex beneath, to 0.4 cm wide proximally, the lateral veins ca. 20, prominulous beneath, at first strict, then arcuate toward the margin, the intervenal areas lightly reticulate, chartaceous, discolorous, densely golden puberulent especially on the costa and the veins, the blades

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[95] *Psychotria dosbocensis* Dwyer, spec. nov. *Frutices* ad 1.2 m alti, ramulis aureo-puberulis. *Folia* oblonga, ad 30 cm longa, ad 18 cm lata, apice obtusa vel rotunda, acuminata venis lateralibus ca. 20, chartacea dense aureo-puberula praecipue in costa venisque; petiolis ad 4 cm longis. *Inflorescentiae* axillares, ad 3.5 cm longae, ad 4.5 cm latae, pedunculo ad 1 cm longo; bracteis bracteolisque brevibus subulatis. *Flores* hypanthio ca. 0.5 mm longis, cupula calycis brevissima carnosa extus ciliis tortis ornata dentibus ad 0.5 mm longis; corolla tubo ad 1.8 mm longo, glabro; antheris exsertis ca. 0.7 mm longis. *Fructus* oblongi, ad 0.6 cm longi, laeves glabri 6-costati.

somewhat scabrous; petioles to 4 cm long, to 0.3 cm wide, golden puberulent, lignose; stipules deciduous. *Inflorescences* axillary, to 3.5 cm long, to 4.5 cm wide, the peduncle short, to 1 cm long, twisted, puberulent, the branches dendritic, short, bracteoles short, subulate, the bracts scarcely larger, triangular subulate. *Flowers* (only one seen) subsessile; hypanthium ca. 0.5 mm long, the calycine cup very short, fleshy, with curled hairs outside, the latter to 0.2 mm long, the teeth 5, triangular, to 0.5 mm long; corolla with the tube cylindrical, to 1.8 mm long, glabrous, the lobes 5, triangular oblong, to 1.3 mm long, ca. 0.9 mm wide; stamens 5, the anthers exserted, oblong, ca. 0.7 mm long, obtuse, the filaments linear, ca. 1 mm long; style not seen; ovarian disc cushion shaped. *Fruits* oblong, to 0.6 cm long, widely deltoid or obtuse at the apex, smooth, glabrous, the raphides numerous, minute, oblong, golden, conspicuously sulcate, the ribs 6, the calyx either absent or persistent and minute.

Psychotria dosbocensis is known only from Panama. It is named after the Rio Dos Bocas, the site where the holotype was collected. It has the largest leaves of the *Psychotria* of Panama with the exception of the newly described *P. capacifolia,* which has a much longer inflorescence. The coloration of the dried leaves have a striking resemblance to those of *P. uliginosa,* which likewise has axillary inflorescences.

VERAGUAS: Valley of Río Dos Bocas on road between Alto Piedra (above Santa Fé) and Calovébora, 350–400 m, *Croat 27427* (MO).

28. **Psychotria dukei** Dwyer.[96] TYPE: Panama, *Kirkbride & Duke 1245* (MO, holotype).

Subshrubs or *shrubs* to 1½ m tall, the stems terete, perhaps regularly carnose, glabrous, drying yellow green, the medullary region porate. *Leaves* elliptic or rhomboid elliptic, 14–17(–20) cm long, 4.0–6.2(–8.5) cm wide, acute or deltoid toward the apex, acuminate, the acumen to 2 cm long, acute, often falcate, attenuate acute at the base, the costa plane or prominulous above, prominulous beneath, convex, to 1.8 mm wide, the lateral veins 12–25, arcuate, scarcely prominulous, the submarginal vein undulate, ca. 1–2 mm from the margin, the intervenal areas patulous reticulate or scarcely visible, rigidly papyraceous to membranous, discolorous, smooth, olive green above, deep green beneath, glabrous, the cystoliths white, dense; petioles (1–)2.0–5.5 cm long, 1.8–2.5 mm wide, ascending, often arcuate; stipules persistent, free, fan shaped, to 1.5 cm long, to 1.2 cm wide, longitudinally bifid or trifid to the middle, the margin with fimbriate and subulate processes, to 4 mm long, to 1.8 mm wide, these often split to the

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[96] *Psychotria dukei* Dwyer, spec. nov. *Suffrutices* vel frutices caulibus fortasse carnosis glabris. *Folia* elliptica vel rhombeo-elliptica, 14–17 cm longa, 4.0–6.2 mm lata, venis lateralibus 12–17 rigido-papyracea ad membranacea glabra cystolithis albis glabris; petiolis 2.0–5.5 cm longis; stipulis persistentibus flabelliformibus, ad 1.5 cm longis, ad 1.2 cm latis, glabris membranaceis margine fimbriis subulatis, ad 4 mm longis. *Inflorescentiae* axillares pedunculo 6–12 cm longo, cymulis capitatis paucifloris; bracteis exterioribus lineari-subulatis vel oblongis, ad 1 cm longis. *Flores* parvi dentibus calycis subulatis, ad 0.5 mm longis; corolla alba vel aurantiaca, ad 8.5 mm longa; antheris ad 1.5 mm longis; stylo 0.2–8.5 mm longo; disco ovarii magno. *Fructus* oblongo-rotundi, 5–7 mm longi, glabri conspicue costati.

apex, unequal, petaloid, glabrous, the cystoliths dense. *Inflorescences* axillary, the peduncle 6–12 cm long, ca. 0.15 cm wide, angular, glabrous, terminated by 3 branches, these disposed like a fan, to 2.5 cm long, each branch terminated by 3 umbel-like branches to ca. 5 mm long, the cymules capitate, few flowered; bracts linear subulate or oblong, 0.85–1.00 cm long, acute or obtuse, lightly carinate; bracteoles enclosing flowers linearly oblong, to 5 mm long, to 1.5 mm wide, often reflexed at the apex, thus the floral mass tuftlike. *Flowers* with the hypanthium ca. 1 mm long, glabrous, the calycine cup short, the teeth 5, linear subulate or triangular, to 0.8 mm long, obtuse or acute, petaloid, the cystoliths narrowly oblong, to 0.1 mm long, white; corolla white or orange, the tube cylindrical, 0.5–8.5 mm long, ca. 1.5 mm wide in the middle, ca. 0.9 mm wide toward the base, petaloid, carnose, glabrous outside, the lobes 5, oblong, 0.5–1.0 mm long, obtuse, conspicuously galeate; anthers elliptic oblong, 0.7–1.5 mm long, obtuse, the filaments ca. 1.5 mm long, carnose, ca. 0.2 mm wide, attached near the orifice; style 0.2–8.5 mm long, ca. 0.2 mm wide, plano compressed, the stigmas 2, subulate, 0.4–0.5 mm long; disc of the ovary 2-lobed, pulvinate, ca. 0.8 mm in diameter, ca. 0.5 mm tall, carnose. *Fruits* oblong rotund, 5–7 mm long, often black, glabrous, and ultimately white when dry, distinctly costate, the cystoliths abundant, white.

Psychotria dukei is known from Panama and Colombia. It is named after James Duke who pioneered in recent times the mass collecting of flowering plants in Panama, especieally in the Province of Darien.

The new species is readily segregated from most of the other Central American *Psychotria* by its large fan shaped persistent stipules which are split to approximately the middle of the body and bear on the margin awl-shaped processes. The cystoliths which cover all parts of the plant are striking. The axillary inflorescences and white fruits are suggestive of *P. macrophylla* Ruiz & Pavón, but *P. dukei* has umbelliform-capitate clusters of flowers disposed in spraylike fashion. *Mori et al. 3750* describe the fruit as white.

DARIÉN: Cerro Pirre, *Bristan 460* (MO); *Duke 6092* (MO); *Duke & Elias 13728, 13769* (both MO); *Gentry & Clewell 7105* (MO). PANAMÁ: Cerro Jefe, trail running NE from summit, 980 m, *Mori et al. 3750* (MO). VERAGUAS: Escuela Agricola Alto Piedra (above Santa Fé), road to Calovebora, 450 m, *Croat 27514* (MO). NW to Santa Fe, 8.8 km, *Mori 6660* (US). 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3114* (MO). COLOMBIA: CHOCO: N of Alto Curiche, *Duke & Idrobo 11224* (MO).

29. **Psychotria durilancifolia** Dwyer.[97] TYPE: Panama, *Croat 26028* (MO, holotype).

Trees to 6 m tall, the branchlets terete or angular, the pith terete, the nodes well spaced, the petiole scars thin, ringlike. *Leaves* lanceolate, 8–13 cm long, 2–

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[97] *Psychotria durilancifolia* Dwyer, spec. nov. *Arbores* ad 6 m altae. *Folia* lanceolata, 8–13 cm longa, 2–4 cm lata, acumine ad 1.3 cm longo, basi attenuato-acuta venis lateralibus 6–7 arcuatis, coriacea supra glabra subtus in costa venisque puberula; petiolis ad 1 cm longis. *Inflorescentiae* terminales solitariae cymosopaniculatae pyramidales, ad 12 cm longae, ad 7 cm latae, pedunculo ad 6 cm longo. *Flores* pedicellis ad 2 mm longis; hypanthio et cupula calycis acetabuliformi, ad 1 mm longa, dentibus nullis; corolla tubo lobis quam breviori lobis ca. 2 mm longis; antheris ad 1.3 mm longis; disco ovarii ad 0.7 mm longo, apice annulo conspicuo ad 1 mm longo.

4 cm wide, acute toward the apex, acuminate, the acumen to 1.3 cm long, attenuate acute at the base, the costa prominulous above, prominent beneath, the lateral veins 6–7, arcuate, not forming an undulate submarginal vein, the intervenal areas smooth, the smallest veins inconspicuous, prominulous, the margins lightly revolute, coriaceous, concolorous, drying reddish brown, glabrous above, puberulous on the costa and veins beneath; petioles to 1 cm long, stiff, abaxially concave and puberulent; stipules not seen. *Inflorescences* terminal, solitary, cymose paniculate, pyramidal, to 12 cm long, to 7 cm wide, the peduncle to 6 cm long, the branches opposite, well spaced, strongly angular ascending, to 6 cm long, with each branch terminated by 3 short branches, the flowers disposed in a few clusters. *Flowers* on short pedicels to 2 mm long, glabrate; hypanthium and calycine cup to 1 mm long, the cup saucer shaped, thickly petaloid, the teeth absent; corolla white, the tube shorter than the lobes, thickly petaloid, glabrous, densely tufted, villose between filament attachment areas, the lobes 5, oblong, 2–3 mm long, slightly cucullate, glabrous; stamens 5, the anthers oblong, 1.0–1.2 mm long, obtuse, the filaments short or 2 times the length of the anthers, attached near the orifice, disc hemispherical, to 0.7 mm long with a conspicuous ring at the apex, to 1 mm long, the style ca. 1 mm long, much dilated above the middle, the stigmas 2, erect, fingerlike. *Fruits* not seen.

Psychotria durilancifolia is known only from Panama. The specific name refers to the leaves being coriaceous and lance-shaped. These vegetative characters, coupled with several floral characters (cup-shaped calyx lacking teeth, the ovarian disc exceeding the calyx and capped by a measurable ring) serve to distinguish the species.

PANAMÁ: El Llano-Cartí Road, Gorgas Lab, Mosquito Project study area, 250 m, *Croat 26028, 26048* (both MO). El Llano-Cartí Road, *Mori 7734* (MO, US).

30. **Psychotria emetica** L.f., Suppl. Pl. 144. 1781. TYPE: Colombia? *Mutis 1602*, not seen.

Cephaelis emetica (L.f.) Pers., Syn. Pl. 1: 203. 1805.
Uragoga emetica (L.f.) Baill., Hist. Pl. 7: 371. 1880.
Cephaelis plagiantha Standley, Field Mus. Nat. Hist., Bot. Ser. 11. 190. 1936. TYPE: Peru, *Klug 2045* (F, holotype).

Small *subshrubs*, to 1 m tall, the roots thick and knotty, the stems simple, terete, strigose. *Leaves* elliptic oblong to oblanceolate, 8–15 cm long, 3–6 cm wide, acute or shortly acuminate at the apex, sometimes abruptly so, acute to attenuate at the base, the costa prominent beneath, the lateral veins 7–11, arcuate, anastomosing near the margin, subprominent beneath, membranaceous, glabrous above, strigose beneath, more so along the veins; petioles 0.5–1.6 cm long, subplane, puberulent; stipules somewhat persistent, free, entire, triangular lanceolate, occasionally subulate, acuminate or obtuse, puberulent. *Inflorescences* axillary, solitary or geminate, subcapitate, to 0.8 cm long, larger in fruit; peduncle slender, to 7 mm long, shorter than or about equal to the petioles; bracts ovate, to 2 mm long, usually acuminate at the apex. *Flowers* subsessile; hypanthium short, the calycine cup 0.8–1.5 mm long, glabrous, the lobes ovate to oblong, 0.9–2.0 mm long, often irregular, acuminate or obtuse; corolla ca. 5 mm long,

white or yellow, the tube glabrous outside, the lobes 5, obtuse, slightly shorter than the tube, pilose within; anthers 5, narrowly oblong, ca. 1.5 mm long, pilose, subsessile, inserted at the middle of the tube. *Fruits* bright blue, drying black, ellipsoidal, 0.5–1.0 cm long, 2.0–2.5 mm wide, glabrous, the 2 pyrenes twisted, each hemispherical in cross section, the ventral face plane with a median ridge and with a small pore at the base, the dorsal face ecostate; albumen entire.

Psychotria emetica ranges from Guatemala to Bolivia. It is readily recognized by its twisted pyrenes, pubescent anthers, and axillary inflorescences. The roots have a strong and somewhat nauseous odor; these are a source of the drug ipecaca but it is said to be inferior to that from *Cephaelis ipecacuanha*. According to James Duke the plant in Darien, Panama, is known as "Raicillo Macho" (Spanish) and as "Macua" or "Moncoa" (Choco). Standley records the name "Raicilla Macho."

BOCAS DEL TORO: Changuinola Valley, *Dunlap 436* (F). Quebrada Huron, *Kirkbride & Duke 449* (MO). 10 mi NW of Almirante, *Nee & Hanson 14084* (MO). Chiriquí Lagoon, *Wedel 1258* (MO). CANAL ZONE: Río Tapia, *Killip 3419* (US); *Standley 26188* (US). Frijoles, *Standley 27448* (US). Río Tapia, *Standley 28217* (US). Gamboa near Río Frijol, *Tyson 1448* (MO). 12 mi S of Colón, *Tyson et al. 4485* (SCZ). Pipeline Road, *Witherspoon & Witherspoon 8299* (MO). BARRO COLORADO ISLAND: *Aviles 10* (F); *Bailey & Bailey 510* (F); *Bartlett & Lasser 16719* (MO); *Croat 4127, 4255, 5512, 5750, 5817, 6212, 6457A, 5607, 7812, 11793, 11925* (all MO); *Ebinger 549* (MO); *Hayden 122A* (MO), *1038* (GH, MO, US); *Kenoyer 565* (US); *Standley 31272, 40899, 41049, 41171* (all US); *Starry 56* (MO); *Weaver & Foster 1451* (MO). DARIÉN: El Real, *Allen 955* (MO, US). La Boca de Pirre, *Bristan 1276* (MO). S of El Real, *Duke 5047* (MO). 10 mi S of El Real on Río Pirre, *Duke 5445* (MO). Without specific locality, *Duke 8345* (MO). Santa Fé, *Duke 8425* (MO). Upper Río Membrillo and Camp 7, *Duke 10903* (MO). Santa Fé, *Duke 12264* (MO). Pucro, *Duke 13030* (MO). Foothills, Cerro Cuasi, *Duke 15553* (MO). Puerto St. Dorothea, *Dwyer 2298* (MO). Campamento Buena Vista, Río Chucunaque above confluence with Río Tuquesa, *Stern et al. 931* (MO, US). PANAMÁ: Cerro Jefe, *Busey 803* (MO). Río Bayano, confluence with Río Chepo, *Duke 3991* (MO). 2 mi upstream from Piria, *Duke 14386* (MO). SAN BLAS: Headwaters of Río Mulatupo, *Elias 1773* (MO).

31. **Psychotria erecta** (Aubl.) Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 24. 1943.

Ronabea erecta Aubl., Hist. Pl. Guiane 1: 156. 1775. TYPE: French Guiana, *Aublet*, not seen.

R. latifolia Aubl., Hist. Pl. Guiane 1: 154. 1775. TYPE: French Guiana, *Sagot 311* (BM, isotype, not seen; photo, NY).

Psychotria axillaris Willd., Sp. Pl. 1: 962. 1798. Not *P. axillaris* Vell. 1827. TYPE: not seen.

Mapouria subsessilis Muell.-Arg. var. *angustifolia* Muell.-Arg. in Mart., Fl. Bras. 6(5): 411. 1881. TYPE: Amazonas, Venezuela, *Spruce 3559*, not seen.

Psychotria fluctuans Standley var. *angustifolia* (Muell.-Arg.) Standley, Publ. Field Columbian Mus., Bot. Ser. 7: 447. 1931. TYPE: Amazonas, Brazil, *Schomburgk 994*, not seen.

Appunia parviflora Lundell, Contr. U. Mich. Herb. 4: 28. 1940. TYPE: Belize, *Gentle 2986* (MICH, holotype).

Shrubs 0.5–8.0 m high, the branchlets 4-angled, ridged, often nigrescent, sericeous or glabrescent. *Leaves* elliptic to oblong, 9–15 cm long, 3–12 cm wide, acuminate at the apex, sometimes abruptly shortly acuminate, attenuate or obtuse at the base, the midvein prominent beneath, the lateral veins 6–12, arcuate, anastomosing close to the margin, the veinlets conspicuous; petioles 6–16 mm long, often stout, sericeous or glabrate; stipules subpersistent, free, entire, lanceolate or subulate, acuminate or obtuse at the apex, sericeous. *Inflorescences* axillary, geminate or solitary, to 8 mm long, densely sericeous, the peduncle short, bearing a few sessile flowers, the bracts minute, to 1 mm long, triangular ovate, acute or

obtuse at the apex. *Flowers* sessile, the calyx cupuliform, the cup ca. 2 mm long, subtruncate or minutely and irregularly toothed, glabrous; corolla white or yellow, the tube ca. 3 mm long, glabrous outside, sericeous in the throat, the lobes oblong, ca. 2.5 mm long, strongly cucullate, glabrous outside, papillose within; stamens 5, the anthers oblong, ca. 1.2 mm long, shortly acuminate at the apex; ovarian disc tubular, ca. 0.8–1.0 mm long, the style thick, ca. 2.8 mm long, dilated above, the stigmas obtuse, ca. 0.6 mm long. *Fruits* elliptic, 5.5–8.0 mm long, 2.5–6.0 mm wide, drying black, glabrous, the pyrenes 2, the ventral face of the seed plane, the dorsal face ecostate but muricate.

This species is known from lowlands and highlands of Panama and Costa Rica.

BOCAS DEL TORO: Punta Pena, *Lewis et al. 2187* (GH, MO, US). Chiriquí Lagoon, *Wedel 2358* (MO). CANAL ZONE: Between Fort Sherman and Fort San Lorenzo, *Croat 15410* (MO). Between Chilibre and Madden Dam, *Dwyer 8405* (MO). Gatún and Gatún Lake, *Johnston 1593* (MO). COLÓN: Santa Rita Ridge, *Correa & Dressler 1048* (MO); *Dwyer & Correa 8405* (MO); *Dwyer & Lallathin 9017* (MO); *Folsom 3701* (MO); *Gentry 6574* (MO); *Porter et al. 4776* (COL, DUKE, MO, SCZ, UC). Santa Rita Lumber Road, 3.1 km E of Agua Clara rain gauge, *Witherspoon & Witherspoon 8310* (MO, US). DARIÉN: 10 mi S of El Real, Rio Pirre, *Duke 5425* (MO). Without other locality, *Duke 9531* (MO). Loma Cuasi, behind Manene, *Duke 13613* (MO). PANAMÁ: Cerro Jefe, *Busey 803* (MO). La Eneida, Cerro Jefe, *Correa & Dressler 965* (MO). El Llano to Carti, *Croat 22875* (MO). Cerro Azul, *Dwyer 2796, 3108* (both MO). Cerro Jefe, *Dwyer & Gauger 7344* (MO); *Dwyer & Gentry 9429* (MO). Cerro Campana, *Folsom et al. 2291* (MO). El Llano to Carti-Tupile, *Kennedy 1778* (MO). Road past Cerro Azul, *Mori & Kallunki 2215* (MO). Gorgas Memorial Lab, 25 mi NE of Cerro Azul, *Mori & Kallunki 3282* (MO). 5–10 km NE of Altos de Pacora, *Mori & Kallunki 6060* (MO). Cerro Jefe, *Tyson et al. 4341, 4363* (both MO). SAN BLAS: Between Mandinga and Cangandi, *Duke 14742* (MO). Río Diabolo and Río Acuati, *Duke 14894, 14898* (both MO). Between Continental Divide and Coast opposite Cartí, *Kennedy 2615* (MO).

32. **Psychotria eugenifolia** Dwyer.[98] TYPE: Panama, *Gentry & Mori 13894* (MO, holotype).

Subshrubs to 2.5 m tall, branching freely, the branchlets slender, smooth, glabrous, the nodes well spaced. *Leaves* elliptic or salicoid, 2.3–6.0 cm long, 1–2 cm wide, regularly 3 times longer than wide, acute to narrowly deltoid toward the apex, acute or attenuate acute at the base, the costa plane above, somewhat prominent beneath, the lateral veins ca. 10(–12), scarcely prominent beneath, the intervenal areas smooth, the minor venation inconspicuous, the margin thinly callose, thinly chartaceous, discolorous, brown above, yellow green beneath when dry, glabrous above, glabrate beneath; petioles 0.3–1.1 cm long; stipules ?connate, cupuliform, truncate, to 1 mm long, each part with 2 subulate, erect, well-spaced awns, ca. 1 mm long. *Inflorescences* terminal, solitary, paniculate, to 6 cm long, to 3.5 cm wide; peduncle to 2.2 cm long, 0.8 mm wide, puberulous, the branches few, the lowermost opposite, to 1 cm long, the rachis often with a pair of branches toward the tip, the cymes few; flowers few; bracts and bracteoles

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[98] *Psychotria eugenifolia* Dwyer, spec. nov. *Suffrutices* ad 2.5 m alti ramulis tenuibus glabris. *Folia* elliptica vel salicoidea, 2.3–6.0 cm longa, 1–2 cm lata, versus apicem acuta vel angusto-deltoidea venis lateralibus ca. 10 tenui-chartacea discoloria infra in sicco luteo-viridia; petiolis 0.3–1.1 cm longis; stipulis fortasse connatis vagina ca. 1 mm longa, parte utraque 2 setis subulatis erectis, ca. 1 mm longis. *Inflorescentiae* terminales paniculatae. *Corolla* alba tubo ad 8 mm longo, extus glabro; antheris ca. 1.5 mm longis.

subulate, the lowermost bracts to 4 mm long. *Flowers* sessile or subsessile; hypanthium short, glabrous, the calycine cup 0.5 mm long, glabrous, the teeth 5, triangular, to 4 mm long, somewhat unequal, membranous, often with a minute gland between the teeth; corolla white, the tube cylindrical, to 8 mm long, narrow below the middle, ca. 1 mm wide, dilated toward the apex, glabrous outside, villose within below the middle, the lobes 5, triangular, 0.7 mm long; anthers oblong, 1.5 mm long, obtuse, the filaments 0.3 mm long, affixed above the middle of the tube; ovarian disc compressed rotund, 0.4 mm long, the style linear, the stigmas linear oblong, 1.8 mm long. *Fruits* blue, sessile, occasionally solitary on short branches simulating pedicels, subrotund or obovate rotund, to 0.4 cm long, truncate, glabrous, the raphides dense, the ribs slender, scarcely prominulous, subtended by 2 widely subulate bracteoles, to 1.5 mm long.

Psychotria eugenifolia is known only from Panama. Its leaves bear a striking resemblance to those of many Myrtaceae, e.g., *Eugenia*. The blades are consistently narrow and are regularly 3 times longer than wide. The tip of the blade is caudate acuminate as in many species of *Faramea*. Occasionally the flowers and fruits appear to be pedicellate, presumably being solitary flowers on short branches. The calycine lobes, measuring about 4 mm, are extraordinarily long for a Panamanian *Psychotria*.

CHIRIQUÍ: Cerro Colorado, top, Bocas Road, 1500 m, *Folsom & Collins 1735* (MO). Cerro Colorado, 50 km N of San Felix, 1200–1500 m, *Mori & Dressler 7856* (MO). DARIÉN: Elfin forest top of W peak of Cerro Tacarcuna massif, 1800–1850 m, *Gentry & Mori 13894* (MO).

33. **Psychotria fendleri** Standley, Contr. U.S. Natl. Herb. 18: 129. 1916. TYPE: Panama, *Fendler 59* (US, isotype).

Subshrubs to 1 m tall, the ultimate branchlets angular, delicately rimose, glabrous, the pith porate. *Leaves* widely oblong or obovate oblong, 3–9 cm long, 2.0–5.5 cm wide, rounded or obtuse or widely deltoid at the apex, only vaguely acuminate, cuneate, obtuse or truncate at the base and contracted abruptly to join the petiole, the costa grooved above, prominulous beneath, the lateral veins ca. 9, prominulous and conspicuous below, forking almost ⅔ of the distance to the margin, the venules evanescent, occasionally with doughnut shaped or crateriform domatia in the axils, the pores to 0.2 mm in diam., the margin conspicuously revolute, coriaceous, concolorous, ashen yellow when dry, glabrous; petioles almost absent or to 0.6 cm long, thick, glabrous; stipules oblong, to 12 mm long, ca. 4 mm wide, obtuse, glabrous, red when dry. *Inflorescences* pseudoterminal with a vegetative branch opposite the peduncle, glabrous, the peduncle to 6.5 cm long, terminated by 4–5 radiate branches, to 4 cm long. *Flowers* white, sessile, the hypanthium turbinate, ca. 1 mm long, the calycine tube subcampanulate, to 2 mm long, petaloid, glabrous inside and out, the teeth 5, triangular, to 0.35 mm long; corolla cylindrical, the tube to 2 mm long, petaloid, glabrous outside, villous at the filament attachment, the lobes 5, oblong, ca. 2 mm long, cucullate and galeate; stamens 5, the anthers oblong, 1.2 mm long, obtuse, fitting snugly under the hood of the petal lobe, the filaments ca. 1 mm long, attached near the middle of the tube; stigmas 2, 0.7 mm long, the style ca. 2 mm long, the ovarian disc compressed rotund, ca. 0.8 mm long, drying black. *Fruits* oblong

rotund, ca. 5 mm in diam., the persistent calyx coroniform, ca. 1 mm long, the pyrenes 2, 5-costate, glabrous, somewhat glandular shiny, bright red at maturity.

Psychotria fendleri is known only from Panama.

CANAL ZONE: Chagres, *Fendler 59* (US). Pina to 3 mi NE of Pina, Fort Sherman Military Reservation, *Liesner 1386* (MO). COLÓN: Miquel de la Borda, *Croat 10023* (MO). Isla Grande, *D'Arcy 4020* (MO). Maria Chiquita, *Dwyer 7783* (GH, MO). Roadside, pasture and scrubby growth along Caribbean at Quebrada Santa Marta, 4½ km SW of Pina, *Nee 11682, 11688* (both MO).

34. **Psychotria fruticetorum** Standley, J. Arnold Arbor. 11: 42. 1930. TYPE: Honduras, *Standley 16597* (F, holotype).

Shrubs to 4 m tall, the branchlets slender, terete, glabrous, the terminal nodes often crowded. *Leaves* oblanceolate, 4–7 cm long, 1.6–3.2 cm wide, the costa slender, plane or grooved above, prominulous beneath, the lateral veins ca. 8, delicate and often wrinkled when dry, stiffly chartaceous, glabrous, smooth beneath when dry, the margin delicately revolute; petioles to 0.35 cm long; stipules deciduous, ovate or trapezoid, to 4 mm long, ca. 2 mm wide at the base, bilobed apically, the awns about as long as the body, glabrous. *Inflorescences* terminal, solitary, paniculate, 3.0–4.5 cm long, glabrous, the peduncles 1.5–2.0(–3.0) cm long, terminating in 2–4 branches disposed radially, to 0.9 cm long, the flowers few; bracts triangular, to 1 mm long. *Flowers* sessile or almost sessile; hypanthium rotund, 0.5–1.0 mm long, the calycine cup to 0.4 mm long, glabrate outside, glabrous and ?eglandular within, the teeth 5, triangular, to 0.6 mm long; corolla white, the tube cylindrical, to 2 mm long, glabrous outside, white villose near the mouth, the lobes oblong, 1.2–1.5 mm long, glabrous; stamens 5, exserted or included in the tube, the anthers 0.6–0.8 mm long, the filaments short, attached near the mouth; style to 1 mm long, dilated near the stigmatic area, the stigmas minute. *Fruits* bright red, subrotund, ca. 4 mm in diam., often scabrous, the ventral face of the endocarp plane, the dorsal face 5-costate.

Psychotria fruticetorum ranges from southern Mexico to Panama.

PANAMÁ: Calzada Larga, *Croat 12389* (MO). Río Tocumen, N of Chepo Road, *Hunter & Allen 240* (MO). San Jose Island, *Johnston 349, 1071* (both G, MO, US).

35. **Psychotria furcata** DC., Prodr. 4: 512. 1830. TYPE: Panama, *Haenke*, not seen.

Shrubs 1–3 m tall, the branchlets slender, terete, often wiry, ultimately plane, puberulent. *Leaves* narrowly lanceolate, ovate oblong, lanceolate or oblong subrotund, 4.5–18.0 cm long, 1.5–7.5 cm wide, acute at the apex, usually contracted into a conspicuous acumen, attenuate, acute or obtuse at the base, often inequilateral, the costa slender, plane or prominulous above, prominulous to prominent beneath, the lateral veins 7–11, arcuate, prominulous, the smaller veins irregular perpendicular, membranous, glabrous or puberulent above, puberulent beneath, occasionally with white, strigose hairs; petioles 0.2–1.6 cm long; stipules connate, to 0.5 cm long, the sheath compressed cylindrical, often less than 1 mm long, each ½ with 2 subulate, erect or spreading awns, slightly longer than or to 5 times as long as the sheath, puberulent. *Inflorescences* terminal, solitary, subcapitate,

to 2 cm long; peduncles to 1.5 cm long; bracts large, linear or linear ovate, to 2.5 cm long, puberulent, usually reflexed. *Flowers* minute, sessile, the buds 3 mm long; hypanthium 0.4 mm long, the calycine cup 0.3 mm long, eglandular within, petaloid, venose, ciliolate, the teeth 5, triangular, about as long as the calycine cup; corolla white, cylindrical, the bud clavate, 2 mm long, petaloid, puberulent outside, puberulent within at filament attachment; stamens 4–5, the anthers linear oblong, ca. 1 mm long, the filaments short; style to 2 mm long, the stigmatic area of the style wider than the basal portion, the stigmatic lobes oblong. *Fruits* rotund, ca. 2.5 mm in diam., glabrous, drying purple or black, the pyrenes with the dorsal face 4–6-ribbed.

Psychotria furcata is known from Costa Rica, Panama, and Colombia.

Without locality, *Duke 8767* (MO). BOCAS DEL TORO: Almirante, *Blum 1358* (MO). Chiriquicito, *Lewis et al. 2058* (GH, MO, US). Water Valley, *Wedel 659, 1637* (both MO). Old Bank Island, *Wedel 1925, 2122* (both MO). Río Cricamola, between Finca St. Louis and Konkintoe, *Woodson et al. 1881* (MO). CANAL ZONE: Pipeline Road, *Croat 12365* (MO). Escobal, *Croat 12463* (MO). Between Fort Sherman and Fort San Lorenzo, *Croat 15412* (MO). Summit Garden, *Croat 16561* (MO). Fort Sherman, *Duke 9243* (MO). K-6 Road, *Dwyer 2859* (MO). Albrook, *Dwyer 6733* (MO). George Greene Memorial, *Dwyer & Hayden 11* (MO). Road to Pina, *Luteyn 1407* (MO). France Field, *Standley 30203* (US). Navy Pipeline Road, *Stimson 5341* (MO). Gamboa, *Tyson 1519, 4561* (both MO). Fort Sherman, *Tyson & Blum 1660* (MO). Pipeline Road, *Witherspoon & Witherspoon 8290* (MO, US). BARRO COLORADO ISLAND: *Aviles 45* (MO); *Croat 4035, 6478, 11334, 11432, 11833* (all MO); *Ebinger 548* (MO); *Kenoyer 560* (US); *Shattuck 84* (MO); *Standley 40886* (US); *Starry 36* (MO); *Welch 19841* (MO). CHIRIQUÍ: Boquete, *Ebinger 752* (MO). DARIÉN: 10 mi S of El Real, *Duke 5417* (MO). Pucro, *Duke 13007* (MO). Río Mortí, Drill Site 7, *Duke 14189* (MO). Cerro Pirre, *Duke & Elias E 13673* (MO). Paya, *Duke & Kirkbride 14011* (MO). Río Tuquesa, Tuquesa Mining Co. Camp called Charco Peje, *Mori 7083* (MO, US). LOS SANTOS: Río Pedregal, 25 mi SW of Tonosí, *Lewis et al. 2891* (COL, DUKE, K, MO, NY, UC, VEN). PANAMÁ: Juan Mina, *Bartlett & Lasser 16559* (MO). Río Maestra, *Duke 4766* (MO). Cerro Jefe near Río Indio, *Duke 15237* (MO). Cerro Azul, *Dwyer 3109* (MO). San Jose Island, *Johnston 87* (MO, US). Gorgas Memorial Lab, ca. 25 km NE of Cerro Azul on Río Piedras, 550 m, *Mori & Kallunki 3270* (MO). Quebrada Ancha, *Steyermark & Allen 17110* (MO). SAN BLAS: Río Cuadi, 6 air mi SW of Mulatupu, *Duke 14214* (MO). Río Diabolo and Río Acuatí, *Duke 14873* (MO). Río Cuadi, Camp Diabolo, Drill site 22, *Duke et al. 3617* (MO, UC, VEN). COLOMBIA: CHOCO: Camp Curiche and Quebrada Changame, 3.7 mi S of Camp Curiche, *Duke & Idrobo* 11580 (NY).

36. **Psychotria goldmanii** Standley, Contr. U.S. Natl. Herb. 18: 130. 1916. TYPE: Panama, *Goldman 1883* (US, holotype).

Shrubs or small *trees*, the branchlets slender, glabrate, drying red, the nodes subturgid. *Leaves* elliptic to elliptic oblong, 3.5–8.5 cm long, 0.8–1.7 cm wide, abruptly long acuminate or caudate acuminate at the apex, the acumen to 1.8 cm long, attenuate acute or cuneate at the base, the costa plane or immersed above, prominulous beneath, the lateral veins 12–14, widely arcuate, evanescent above, stiffly chartaceous, conspicuously discolorous, dark red above, silvery beneath, glabrous, glandular shiny; petioles slender but stiff, flexuous, to 2.5 cm long; stipules presumably connate, the sheath oblong rotund, ca. 1 mm long, each part bilobate, the lobes short, 0.1–1.0 mm long, acute to obtuse. *Inflorescences* terminal, equal to or exceeding the uppermost leaves, to 8 cm long, corymbose paniculate, the peduncles 2–3 cm long, slender, the branches opposite, spreading, to 1.5 cm long; bracts linear to lanceolate, 2–4 mm long; bracteoles deltoid ovate

to oblong, to 0.3 mm long, obtuse or acute, glabrous. *Flowers* with the hypanthium ca. 0.5 mm long, the calyx cup ca. 0.5 mm long, glabrous, with several glands at the base within, the teeth scarcely developed or to 1 mm long, usually rounded and irregular marginate; corolla greenish white or white, the tube cylindrical, ca. 5 mm long, often dilated above, glabrous outside, villose within, the lobes 1–2 mm long, to 1 mm wide, obtuse; stamens 5, the anthers partially exserted, oblong, ca. 1.2 mm long, the filaments ca. 1.5 mm long, attached about 1 mm below the orifice; ovarian disc hemispherical, prominent, bilabiate at summit; style ca. 3 mm long; stigmas slender, villosulose. *Fruits* oblong rotund, ca. 4 mm in diameter, costate, blue, drying black, glabrous, the calycine cup persistent.

Psychotria goldmanii is known only from Panama and Costa Rica. One fruiting collection, *Standley & Valerio 44048* (F) from Costa Rica has much wider leaf blades and is grey green beneath. The awns of the stipules exceed the body in length. The fruit is described as blue.

CHIRIQUÍ: Above San Felix, 18–27 mi off Panamerican Highway, above Chame or turnoff to Escopeta, 1200–1500 m, *Croat 33119* (MO). Vicinity of Cerro Colorado Copper Mine, 28 mi above San Felix, 1200–1500 m, *Croat 33201* (MO). Cerro Colorado Road between San Felix and Cerro Colorado, 30 km above bridge of Rio San Felix, 1610–1690 m, *Croat 37129, 37143* (both MO). Cerro Colorado, *Folsom 1742, 1777* (both MO). Cerro Horqueta, ca. 2200 m, *Hagen & Hagen 2037* (F). N of San Felix at Chiriqui-Bocas del Toro border on Cerro Colorado Copper Mine Road, ca. 1800 m, *Mori & Kallunki 5893* (MO). Cerro Colorado, 35.6 km from Rio San Felix Bridge, 1390 m, *Sullivan 383* (MO). DARIÉN: Summit Pico Tacarcuna, highest point of Serrania del Darien, 1850 m, *Gentry et al. 16909* (MO). PANAMÁ: Mount Pirre, headwaters of Rio Limon, *Goldman 1883* (F, US).

37. **Psychotria graciliflora** Benth. in Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 35, 1853. TYPE: Costa Rica, *Oersted,* not seen.

Shrubs to 1½ m tall, the ultimate branches smooth, glabrous, dense, the plant usually flat topped, the nodes well spaced. *Leaves* elliptic, obovate elliptic, rarely ovate rotund, occasionally falcate and slightly inequilateral, 2–7 cm long, 0.8–2.5 cm wide, acute to obtuse at the apex, usually acuminate, the acumen often arising from a contracted apex, to 0.5 cm long, often falcate, attenuate cuneate or acute at the base, the costa slender, plane or prominulous above, prominulous beneath, dull rubescent on drying, the lateral veins 6–7, arcuate, chartaceous, drying dark, glabrous except occasionally minutely puberulent on the costa, somewhat glandular punctate beneath; petioles 0.3–1.0 cm long, slender; stipules free, ovate oblong, ca. 3 mm long, bilobate, the lobes subulate, about as long as the body. *Inflorescences* terminal, solitary, glabrous, shorter than the leaves, to 3.5 cm long, the peduncle capillaceous, to 2 cm long, 0.35 mm wide, with usually 2 sets of branches, the lowermost opposite, the bracts widely ovate, usually irregularly trilobate, to 3 mm long. *Flowers* usually sessile, 4–5-merous, the calyx to 1.4 mm long, the cup minutely puberulent outside with 5 well-spaced minute glands within, the teeth unequal, about as long as the calyx cup; corolla white, the tube cylindrical, ca. 3 mm long; glabrous outside, villose within at the mouth, the lobes oblong, to 1.5 mm long, glabrous; stamens with the anthers oblong, ca. 0.5 mm long, the filaments ca. 0.5 mm long; ovarian disc subglobose, 0.6 mm long, the style to 4 mm long, the stigmas oblong, 0.5 mm long. *Fruits* rotund, 3–5 mm

in diam., glabrous, raphides abundant, each pyrene 4–5-costate, the persistent calyx to 1 mm long.

Psychotria graciliflora ranges from Honduras to Panama.

CANAL ZONE: Coco Solo, *Gentry 6475* (MO). France Field, *Standley 30178* (US). Fort Sherman, *Standley 31070* (US). CHIRIQUÍ: Palo Santo, 3 mi N of Volcán, *Croat 13594* (MO). NW side of Cerro Pando, *Croat 15906* (MO). La Popa above Boquete, 5200 ft, *D'Arcy & D'Arcy 6393* (MO, NY). Volcan to Rio Serano, *Folsom 4025* (MO). Between Pinola and Quebrada Hondo, *Kirkbride & Duke 903* (MO, NY). Upper Río Gariché, *Seibert 358* (MO). COCLÉ: El Valle, *Duke 13147* (MO). Cerro Pilón, *Dwyer & Lallathin 8664* (MO); *Liesner 767* (MO, NY). DARIÉN: El Real, *Bristan 83* (*Duke 9190*) (MO). Quebrada Venado and Peje Swamp, *Bristan 1018* (MO). Río Canclon, *Bristan 1494* (MO). 16 km from Yaviza along Quebrada Uvital, *Duke 4993* (MO, US). Río Pirre, *Duke 8255* (MO). Río Mortí, Drill Site 7, *Duke 14184* (MO). Río Tuquesa, Middle Tuquesa Mining Co. Camp called Charco Peje, *Mori 7080* (MO). Campamento Buena Vista, Río Chucunaque, *Stern et al. 921* (G, MO, US). Santa Fé, *Tyson et al. 4634* (MO). PANAMÁ: Río La Maestra, *Allen 25* (G), *27* (MO). Río Pita, *Duke 4794, 4802* (both MO). Río Bayano, *Duke 14393* (MO). Cerro Jefe, 2100–2200 ft, *Duke 15237* (MO). Maje, on Choco Indian Trail about 5 mi up Río Maje, *Foster & Kennedy 2010* (MO). Río Pasiga, road toward Río Maestro, *Gentry 2314* (MO). Las Cumbres, *Gomez 7* (MO). Cerro Campana, *Kirkbride & Hayden 298* (MO). Cerro Campana, trail to summit, 870–1000 m, *Mori & Kallunki 3543* (MO). Arraíjan, near Río Aguacate, *Rodriguez 2* (MO).

38. **Psychotria granadensis** Benth. in Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 34. 1853. TYPE: Nicaragua, ?*Oersted*, not seen.

Subshrubs to 1½ m tall, the branchlets terete, ultimately angular, smooth, glabrous, the nodes well spaced. *Leaves* narrowly lanceolate, to 20 cm long, to 6.3 cm wide, tapering obtusely or acutely toward the apex, the apex often contracted into an acumen to 0.8 cm long, attenuate acute at the base, the costa grooved or plane above, usually drying gray white (as also the lateral veins), prominulous beneath, often delicately alate laterally, the lateral veins 15–18, widely arcuate, occasionally with domatia in the axils, chartaceous, drying deep green or gray green above, glabrate; petioles to 5 cm long, wiry, glabrous; stipules free, presumably ovate rotund, to 0.8 cm long, ca. 0.5 cm wide at the base, apically with 2 oblong lobes as long as or shorter than the body, stiffly scarious, rubescent, glabrate. *Inflorescences* terminal, solitary, cymose paniculate, often hemispherical, to 4 cm long, to 6.5 cm wide, the peduncle to 0.5 cm long or suppressed, the branches several, flabellate, and with 1–2 paired or 3-ternate branches, the cymules compressed, dense. *Flowers* sessile or subsessile, ca. 3 mm long, the hypanthium oblong, the calycine tube short, 0.3 mm deep, with a few glands within, glabrous inside, puberulent within, the teeth 5, triangular, 0.5 mm long; corolla tube compressed cylindrical, 1.5 mm long, densely villose near the mouth, the lobes 5, oblong, 1.3 mm long, subcarnose, cucullate; stamens 5, the anthers oblong, 0.75 mm long, the filaments short, attached at the apex of the tube; style short or long, 0.4–1.7 mm long, dilated apically; stigmas subulate, 0.3 mm long, the ovarian disc compressed rotund, 0.35 mm in diam. *Fruits* aggregate, rotund, red, drying red, glabrous, the 2 pyrenes costate, the 4 grooves conspicuous, the calycine cup often persistent, less than 1 mm long.

Psychotria granadensis extends from Guatemala to Panama. It seems closely related to *P. nervosa* Sw. and *P. tenuifolia* Sw.

CANAL ZONE: Miraflores Lake, *White 123* (MO). BARRO COLORADO ISLAND: *Croat 7316, 14997, 16202, 17049* (all MO); *Standley 41105* (US). VERAGUAS: Alto Piedra Santa Fé, *Lao 519* (MO).

39. **Psychotria grandis** Swartz, Prodr. 43. 1788. TYPE: Costa Rica, *Oersted 11613* (US, isotype).

Trees, usually 5–7 m tall, the branchlets terete, the ultimate branches usually markedly nodose, the internodes twisted, subangular, glabrous. *Leaves* oblong, often narrowly so, occasionally obovate oblong, rarely oblong rotund, usually 3 times longer than wide, 12–30 cm long, 4.0–10.5 cm wide, acute to deltoid at the apex, acuminate, the acumen short, attenuate acute basally, the costa plane to prominulous above, often delicately rimose, conspicuously rimose beneath, to 0.2 cm wide basally, thinly coriaceous or stiffly papyraceous, concolorous or somewhat discolorous, glabrous, the lateral veins 12–15, well spaced, those in the middle of larger blades 1–2 cm apart, prominulous above and beneath, widely arcuate; petioles 1–4 cm long or absent; stipules free, large, ovate or ovate rotund, to 2 cm long, the awns shorter than the body, tending to persist on ultimate branchlets, coriaceous, smooth, delicately venulose, drying black or brown. *Inflorescences* terminal, solitary, paniculate, to 26 cm long, to 20 cm wide, glabrate, the peduncles to 22 cm long, to 0.3 cm wide, angular, the lowermost branches 4-nate, to 3 cm long, the upper set of branches 2–3, usually ternate or 4-nate, angular, the bracts and bracteoles minute, deciduous. *Flowers* sessile, heterostylous; hypanthium rotund, 1.5 mm long, the calycine cup short, expanded, minutely puberulent outside, eglandular within, the teeth 5, triangular, 0.2–0.8 mm long; corolla white, the tube cylindrical, ca. 2 mm long, petaloid, venose, glabrous outside, densely bearded well below the mouth at the filament attachment position; stamens exserted or not, the anthers narrowly oblong, 1 mm long; styles to 5 mm long, with the stamens included, short styles with exserted anthers, the stigmas slender, either as broad as long or to 4 times longer than broad. *Fruits* rotund to oblong, to 0.7 cm in diam., black, glabrescent, scarcely ribbed, the calycine cup often persistent, minute.

Psychotria grandis extends from Mexico to northern South America. It also occurs in Jamaica. "Rabo de Puerco."

BOCAS DEL TORO: Almirante, *Blum 1414* (MO). Changuinola Valley, *Cooper & Slater 33* (F, US). RR stop Mila 7.5, *Croat & Porter 16266* (MO). Sursuba, *Dwyer 4387* (US). Rio Teribe near Quebrada Lukulon, *Kirkbride & Duke 511* (MO). Río Cricamola between Finca St. Louis and Konkintoe, *Woodson et al. 1918* (G, MO). CANAL ZONE: Fort Sherman, *Blum 1680* (MO); *Blum & Dwyer 398* (MO); *Duke 9239* (MO); *Dwyer 6911, 7179* (both MO); *Ebinger 387* (MO). Pipeline Road, *Kennedy 1857* (MO). Fort Sherman, *Standley 31036, 31053* (both US); *Stimson 5115* (MO); *Tyson & Dwyer 1185* (MO). 12 mi S of Colon, *Tyson et al. 4481* (MO). BARRO COLORADO ISLAND: *Croat 10821, 11960* (both MO), *12757* (MO, NY), *14872* (MO), *15090* (F, MO); *Ebinger 387* (US); *Foster 1060* (F, MO); *Standley 40975* (US); *Weaver & Foster 1443* (MO); *Woodward & Vestal 700* (G, MO). CHIRIQUÍ: 10.5 km W of Puerto Armuelles, *Busey 522* (MO). Progreso, *Cooper & Slater 186* (F, US). 8 mi W of Puerto Armuelles, *Liesner 354* (MO). San Bartolome Peninsula, *Woodson & Schery 946* (MO). COCLÉ: Cerro Pilón, *Dwyer et al. 4553* (MO). COLÓN: Santa Rita Ridge, *Correa & Dressler 600* (MO). DARIÉN: El Real, *Allen 951* (MO). Junction Río Chucunaque and El Tuira, *Correa & Lazor 1547* (MO). Río Balsa between Río Areti and Manene, *Duke 8773* (MO). Río Pinas, *Duke 10568* (MO). Estero Grande off Río Marga, *Duke 10953* (MO). Santa Fé, *Duke 14248* (MO). Puerto St. Dorothea, *Dwyer 2239* (MO, NY). Manene to mouth of Río Cuasi, *Kirkbride & Bristan 460* (MO). Campamento Buena Vista, Río Chucunaque, *Stern et al. 935* (MO, US). Pacora, *Allen 2035* (MO). Río Pita, *Duke 4759* (MO). Panamerican Highway between El Llano and Río Mamoní, *Duke 5643* (MO). Mainland opposite Playon Chico, *Gentry 6417* (MO). El Llano-Carti Road, 1.4 km N of Panamerican Highway, 150 m, *Nee & Dwyer 9235* (MO). SAN BLAS: Puerto Obladía, *Croat 16874* (MO). Rio Cuadi, Camp Diabolo (Drill Site 22), *Duke et al. 3652* (MO). VERAGUAS: Isla de Coiba, *Dwyer 1540* (MO).

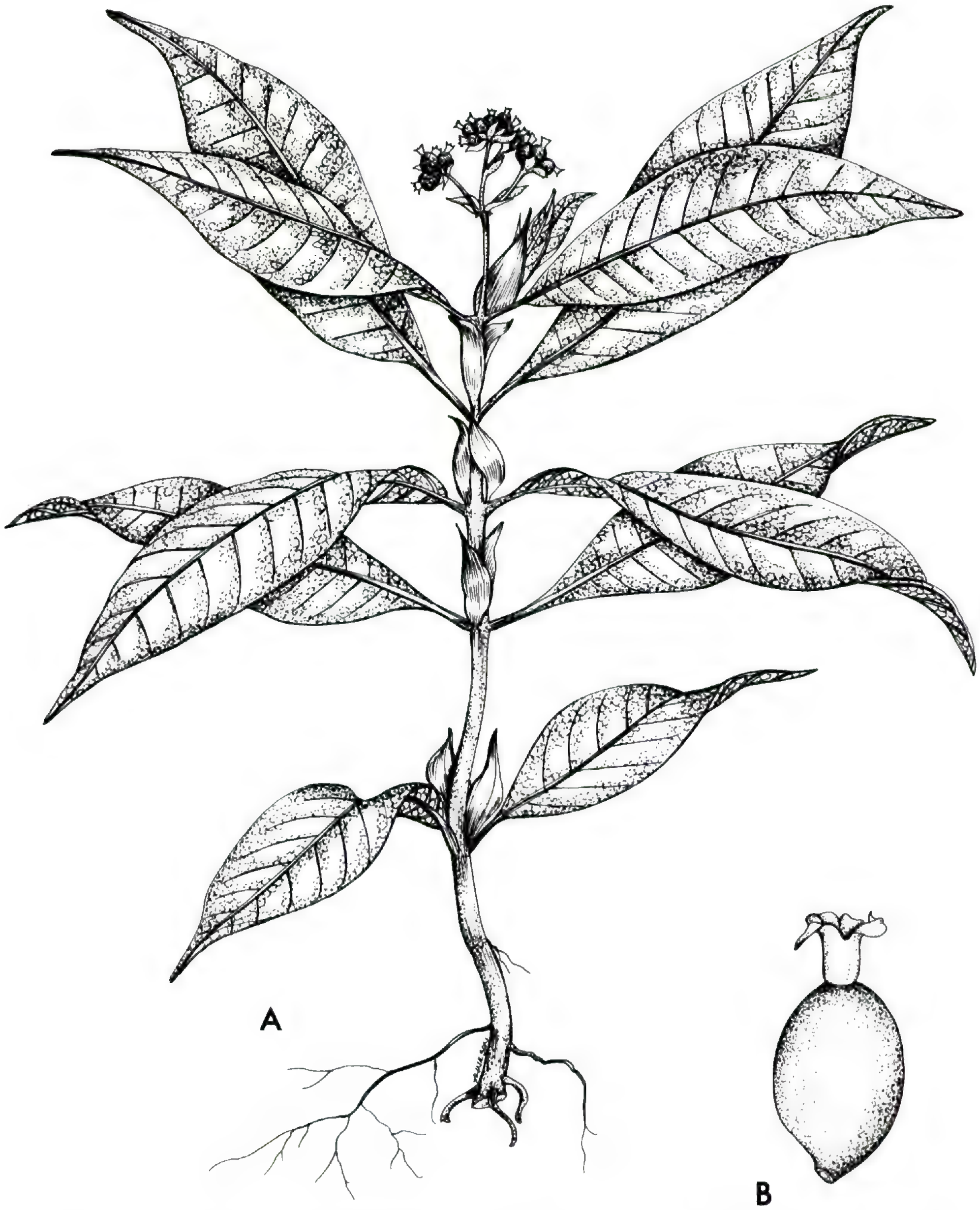

FIGURE 72. *Psychotria hammelii* Dwyer.—A. Habit (×½).—B. Fruit (×3½). [After *Hammel 4634*.]

40. **Psychotria haematocarpa** Standley, J. Wash. Acad. Sci. 18: 274. 1928. TYPE: Costa Rica, *Standley & Valerio 47194* (US, holotype).

Shrubs to 2 m tall, branching freely, the branchlets terete, ultimately angular, glabrous. *Leaves* narrowly or widely lanceolate or oblong lanceolate, sometimes falcate, 5–15 cm long, 1–5 cm wide, acute at the apex or obtuse, often acuminate, the acumen to 2 cm long, basally acute or attenuate acute, the costa slender

above, prominulous beneath, the lateral veins 10–13, prominulous beneath, white when dry, arcuate, with 1–3 veins intermediate between a pair of lateral veins, these soon branching, the submarginal vein undulate, 0.2–0.7 cm from the margin, stiffly chartaceous, concolorous, glabrous; petioles 0.3–1.6 cm long, rigid, 0.1 cm wide, glabrous; stipules free, widely compressed rotund, the body to 2.5 mm long, coriaceous when dry, glabrous, the awns 2, subulate, longer than the body. *Inflorescences* terminal, 1.5 cm long, the peduncle short, to 1 cm long, ca. 0.5 mm wide, glabrous, the branches (0–)1–3, to 1.5 mm long, radially disposed, each branch (when fruits deciduous) terminated by a few scars; bracteoles deciduous from the base of the branches, few, subulate, ca. 1 mm long. *Flowers* not seen. *Fruits* sessile, orange when dry, rotund, 4–6(–8) mm in diam., each pyrene ultimately 4-sulcate, smooth, glabrous, the calycine cup often persistent, 0.8–1.5 mm long, the teeth triangular, ca. 0.5 mm long.

Psychotria haematocarpa is known from Costa Rica, Panama, and Colombia. The type from Costa Rica was collected at 900 m. The species is recognized by a combination of characters: the leaf blades with the lateral veins usually white when dry; the submarginal vein well set in from the margin; the inflorescence much reduced, and fruit drying orange.

Several collections from Nicaragua may be *Psychotria haematocarpa*. These collections are labeled *P. pervilis* Standley & Williams, an unpublished name: *Shank & Molina 4675, 4780* (both US), *4887, 4960* (both F). The first two of these have inflorescences with elongate reflexed bracts to 1.2 cm long, suggestive of *P. officinalis*.

COCLÉ: Cerro Pilon, ca. 2700 ft, *Duke & Lallathin 15000* (MO); *Dwyer 8331* (MO); *Gentry 3640* (MO). 3 mi NE of El Valle, *Mori & Kallunki 2962* (MO). COLÓN: Rio Guanche, *D'Arcy 9687* (MO). Santa Rita Ridge trail, 17–35 km from Boyd-Roosevelt Highway, 400–800 m, *Mori & Crosby 6319* (MO). Santa Rita Road, ca. 6 km from Boyd-Roosevelt Highway, *Mori & Kallunki 2154* (MO). DARIÉN: Loma Cuasi, behind Manene, *Duke 13612* (MO). 1 mi SE of Rio Tuira, *Duke 14575* (MO). Between Río Diabolo and Río Acuati, *Duke 14882* (MO). Puerto St. Dorothea, *Dwyer 2267* (MO). VERAGUAS: Between Escuela Agricola Alto Piedra and Calovebora, 15.6 km NW of Santa Fe, 450–550 m, *Croat 27568* (MO). 8.8 km from Agricola Alto de Piedra, *Mori & Kallunki 3212* (MO). COLOMBIA: CHOCO: Municipio de Riosucio, Parque Natural Nal. Los Katyos, Subida al Alto Del Limon, 300–380 m, *Leon 435* (MO).

41. **Psychotria hammelii** Dwyer.[99] TYPE: Panama, *Hammel 4634* (MO, holotype; isotype PMA).—FIG. 72.

Subshrubs, the ultimate branchlets terete, smooth, glabrescent, moderately slender, dark red when dry, the nodes well spaced, subturgid. *Leaves* narrowly elliptic to obovate elliptic, often scarcely falcate, 8.5–12.0 cm long, 2.5–4.0 cm wide, deltoid toward the apex, acuminate, the acumen to 2 cm long, 0.5–0.8 cm wide, cuneate or acute at the base, the costa plane or immersed above, prominulous beneath, the lateral veins ca. 15, immersed above, widely arcuate and

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[99] *Psychotria hammelii* Dwyer, spec. nov. *Suffrutices. Folia* angusto-elliptica vel obovato-elliptica, 8.5–12.0 cm longa, 2.5–4.0 cm lata, acumine ad 2 cm longo, costa supra plana vel immersa venis lateralibus ca. 15 areis inter venas supra bullatis laminis rigido-membranaceis supra glabris infra puberulis; petiolis gracilibus; stipulis liberis oblongis, ad 2 cm longis, processibus duobus, ca. 3 mm longis. *Inflorescentiae* cymoso-paniculatae ad 12 cm longae, ad 4 cm latae, pedunculo ad 5 mm longo. *Fructus* sessiles oblongo-rotundi, ad 6 mm longi, ad 5 mm lati, glabri in sicco rubri.

forming an undulate submarginal vein, the intervenal areas patulous reticulate, distinctly bullate above, rigidly membranous, discolorous, dark red and glabrous above, puberulous beneath; petioles slender, stipules free, persistent only at the apex of twigs, oblong, to 2 cm long, with 2 slender erect processes 3 or more mm long, the body petaloid, apparently split lengthwise near the base or middle at maturity; venose, glabrous, red when dry; raphides numerous, minute. *Inflorescences* cymose paniculate, to 12 cm long, to 4 cm wide, the peduncle slender, to 5 cm long, to 0.15 cm wide, delicately winged, usually terminated by 2–3 branches, 1.0–1.6 cm long, unequal, spreading, each with 2–3 secondary branches, the cymes 2–3-flowered, bracteoles narrowly oblong, to 4 mm long. *Flowers* not seen except for the persistent calyx. *Fruits* sessile, oblong rotund, to 6 mm long, to 5 mm wide, obtusely costate, glabrous, drying red, the persistent calyx cup 0.7 mm long, the lobes triangular oblong, to 1 mm long, glabrous.

Psychotria hammelii is known only from Panama. It is recognized by the bullate character of the leaves. The stipules are diagnostic, being large, drying bright red, and having 2 erect antenna-like awns. Whether the stipules are naturally torn lengthwise as seen in the type material demands investigation. The collectors of the type note: "mature fruits red; leaves bullate, metallic dark above; leaf often similar to that of Urticaceae; 2 seeds, smooth on the bottom with a line; stoloniferous."

BOCAS DEL TORO: E slope of La Zorra, forest to divide, mossy cloud forest, *Kirkbride & Duke 812* (MO). VERAGUAS: W of Alto de Piedra W of Santa Fé, 3200–5600 ft, *Hammel 4634* (MO, PMA).

42. **Psychotria horizontalis** Swartz, Nov. Gen. Sp. Pl. Prodr. 44, 1788. TYPE: Hispaniola, *Swartz,* not seen.

P. glaucescens H.B.K., Nov. Gen. Sp. Pl. 3: 358. 1819. TYPE: Venezuela, *Humboldt & Bonpland,* not seen.
P. bimea Riley, Kew Bull. 1927: 124. 1927. TYPE: Panama, *Riley 112* (K, holotype).
P. horizontalis var. *glaucescens* (H.B.K.) Steyermark, Mem. N.Y. Bot. Garden 23: 472. 1972.

Shrubs to 5 m tall, usually branching freely, the branchlets terete, slender, smooth, glabrous, the terminal nodes usually proximate. *Leaves* oblong, occasionally elliptic or obovate elliptic, 6–16 cm long, 2–8 cm wide, deltoid or subobtuse at the apex, rarely acute, acuminate, the acumen to 1.5 cm long, often falcate, ultimately obtuse, basally cuneate, obtuse or attenuate acute, occasionally cordate, rarely truncate, the costa prominulous above, often distinctly grooved, prominent beneath and usually with an evident pore in the axils of the secondary veins, the lateral veins 5–10, arcuate and forming an undulate, submarginal vein to 1 cm from the margin, stiffly chartaceous, concolorous, glabrous above, glabrous to puberulent beneath; petioles absent or to 0.5(–0.9) cm long, slender, to 0.13 cm wide, glabrous or minutely puberulent; stipules deciduous, ovate oblong, to 8 mm long, obtuse or acute, rubescent outside, glabrous, setose within. *Inflorescences* terminal, solitary, paniculate, to 8 cm long, usually 2 times longer than wide, puberulent or glabrous; peduncles 1.5–6.0 cm long, usually terminating in 5 radially disposed branches or the rachis extended and the branches in 2 well-spaced pairs, the cymules terminal. *Flowers* pedicellate, the pedicels to 2 mm long, the hypanthium short, the calycine cup ca. 1 mm long, pubescent, petaloid, eglandular or with 5 well-spaced glands within, glabrous within, the

teeth 5, 1.0–2.5 mm long, sometimes unequal, acute; corolla white or yellow, the tube cylindrical, 2–4 mm long, puberulent to glabrate outside, with soft, white, elongate hairs within near the point of filament attachment, the lobes 5, oblong, petaloid, venose, about ½ the length of the tube, obtuse or acute; stamens 5, exserted, the anthers narrowly oblong, ca. 1 mm long, the filaments slender, to 2 mm long, attached near the mouth; ovarian disc pulvinate, ca. 0.3 mm long, the style 1.5–2.0(–7.0) mm long (fide Croat), the stigmas 2, digitiform, ca. 1 mm long, papillose. *Fruits* subglobose, 4–5 mm in diam., minutely puberulent, distinctly furrowed, the calyx often persistent, to 2 mm long.

Psychotria horizontalis ranges from Mexico south to Ecuador. It also occurs in the West Indies. It is usually recognized by a combination of characters: inflorescence with branches usually 5-radiate, "domatia" usually in the axils of the veins, the fruits with persistent elongate calyx.

CANAL ZONE: Madden Dam, *Allen 2563* (F). Fort Kobbe, *Duke 4701, 4197* (both MO). Fort Sherman, *Duke 6910* (MO). K-9 Road, *Dwyer 2620, 2858* (both MO). Madden Dam, *Dwyer & Hayden 23* (MO); *Dwyer & Lallathin 8816* (MO). Mandingo Road, *Hayden 59* (MO). Madden Dam, *Kirkbride 39* (MO). Río Petitpie, road to Fort Sherman from Gatún Locks, *Mori & Kallunki 2658* (MO). RR and Panama Canal, 6 km W of Gamboa, *Nee 7207* (MO). 1 km NW of Gamboa, *Nee 9543* (MO). Gatún, *Standley 27181* (US). Las Cruces Trail, *Standley 39178* (US). K-9 Road, *Stern et al. 15* (MO). Road K-9, Río Cocoli, *Stern et al. 325* (MO). Miraflores Lake, Chiva-Chiva Trail, *Tyson 1345* (MO). Old Fort Lorenzo, *Tyson 2233* (MO). Fort Sherman, *Tyson & Dwyer 1186, 1197* (both MO). 12 mi S of Colón, *Tyson et al. 4472* (MO). Miraflores, *White 139* (MO). BARRO COLORADO ISLAND: *Aviles 9* (MO); *Bailey & Bailey 393, 566* (both F); *Croat 4110, 4138* (both MO), *4383* (F, MO), *4752, 4985, 5083, 5137, 5498, 5578, 6011, 6274, 6300A, 6383, 6824, 9226, 10758* (all MO); *Dwyer 1411* (MO); *Ebinger 251* (MO), *556* (F, MO), *878* (MO); *Hayden 15, 38, 138, 175* (all MO); *Shattuck 1025* (F, MO, US); *Standley 40993, 41094* (both US); *Starry 164* (MO); *Witherspoon & Witherspoon 8693* (MO). CHIRIQUÍ: Boquete and Cerro Horqueta, *Duke 13701* (MO). COCLÉ: El Valle, *Duke 13246* (MO). Penonomé, *Dwyer 1100 A* (MO). El Cope, *Garner 40* (MO). COLÓN: Isla Grande, *D'Arcy 4020* (MO). Achiote, *Folsom 3859* (MO). Near home of P. H. Zimmerman, *Folsom et al. 3327* (MO). DARIÉN: Río Tuira, *Duke 4953, 4954* (both MO). Río Mortí near Mortí Arriba, *Duke 8443* (MO). Río Chucunaque, Cativo Swamp, *Duke 11743* (MO). Río Mortí, *Duke 14178* (F). Mortí Hydro, *Duke 14238* (MO). Piria-Cañasas trail near Piria, *Duke 14313* (MO). Cañasas and Sabalo, *Duke 14470* (MO). Río Mortí, Mortí Hydro, *Duke 15822* (MO). Without other locality, *Duke & Bristan 102* (MO). El Real, *Duke & Bristan 288* (MO). Without other locality, *Sexton 115* (MO). Yaviza, *Stern et al. 164* (MO, US). HERRERA: Ocú, *Ebinger 1058* (F, MO), *1071* (MO). LOS SANTOS: Río Pedregal, 25 mi SW of Tonosí, *Lewis et al. 2915* (COL, MO, UC, VEN). Guaniquito, near Tonosí, *Luteyn & Foster 1382* (F, MO). PANAMÁ: Perlas Archipelago, *Anderson s.n.* (F). Isla del Rey, *Correa 111* (MO). Coronado Beach, *Duke 11801* (MO). San Jose Island, *Erlanson 213, 236, 477, 556* (MO). Bella Vista, *Maxon & Valentine 6937* (US). Trapiche Island, *Miller 1900* (US). Los Asientos, *Wendehake 40* (MO). Isla Taboga, *Woodson et al. 1459* (F, MO).

43. **Psychotria impatiens** Dwyer.[100] TYPE: Panama, *Mori & Kallunki 5446* (MO).

Shrubs to 2 m tall, the twigs leafless except terminally, terete, finally angular, the bark grey when dry, glabrous, the nodes moderately turgid, crowded. *Leaves* (immature) ovate lanceolate, to 2.6 cm long, 0.7–1.0 cm wide, acute at the apex, cuneate at the base, the costa prominulous on both sides, the lateral veins ca. 7,

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[100] *Psychotria impatiens* Dwyer, spec. nov. *Frutices* ad 2 m alti foliis saepe persistentibus solum versus apicem ramulorum, glabri. *Folia* hic immatura ovato-lanceolata, ad 2.6 cm longa, 0.7–1.0 cm lata, venis lateralibus ca. 7 membranacea glabra; petiolis nullis vel ad 1 mm longis; stipulis persistentibus versus apicem ramulorum basi connatis ovato-ellipticis, ad 3 mm longis, 1.5 mm latis, acutis patulis glabris. *Inflorescentiae* terminales compresso-paniculatae, pedunculo nullo vel conspicue reducto floribus paucis. *Flores* subsessiles; dentibus calycis 0.3 mm longis; corolla tubo 5–6 mm longo extus glabro. *Fructus* non visi.

arcuate, the submarginal vein to 1 mm from the margin, membranous, concolorous, glabrous; petioles absent or to 1 mm long; stipules persistent toward the tips of the twigs, connate basally, ovate elliptic, to 3 mm long, 1.5 mm wide, acute, glabrous. *Inflorescences* terminal, compressed paniculate, shorter than the leaves, to 1.2 cm long, to 1.5 cm wide, the peduncle obsolete, with few, ascending branches, the flowers ca. 12, the bracteoles minute, ovate. *Flowers* subsessile, the hypanthium to 1 mm long, glabrous, the calycine cup moderately turgid, 0.3 mm long, the lobes 5, triangular, 0.3 mm long, often spreading or somewhat reflexed; corolla white, the tube narrowly cylindrical but inflated toward the apex, 5–6 mm long, glabrous outside, villose within above the middle, the lobes 5, narrowly oblong, to 3 mm long, sparsely pubescent within; style linear, to 7 mm long, the stigmas oblong, to 1.7 mm long, obtuse. *Fruits* not seen.

Psychotria impatiens is known only from Panama. Its precocious inflorescence is unique among the *Psychotria* of Panama. The juvenile leaves are virtually sessile and crowded at the tips of the twigs. The nodose character of the twiglets is diagnostic as are the spreading subcoriaceous stipules which seem connate basally, drying a dull brown. The much reduced inflorescence is noteworthy.

DARIÉN: N slope of Cerro Pirre, lower montane rain forest (cloud forest), ca. 700–950 m, *Mori & Kallunki 5446* (MO).

44. **Psychotria indigotica** Dwyer.[101] TYPE: Panama, *Hladik 511* (MO, holotype).

Trees to 7 m tall, the branchlets terete, smooth, glabrous, dull yellow when dry, the nodes well spaced. *Leaves* ovate oblong, 8.5–15.0 cm long, 4–9 cm wide, deltoid toward the apex, often acuminate, the acumen to 0.5 cm long, obtuse or rounded at the apex, the costa slender above, prominulous beneath, yellowish white when dry, the lateral veins 5–7, arcuate, prominent beneath, yellowish white, with 1–2 veins between a pair of lateral veins, these soon disappearing, the smaller veins pinnatiform, conspicuous and yellowish white, the undulate submarginal vein only ca. 3 mm from the margin, thinly coriaceous, glabrous, greenish yellow when dry; petioles rigid, to 3.5 cm long; stipules connate, crater shaped, to 0.2 cm long, coriaceous, glabrous, puberulent on both sides, without teeth or lobes. *Inflorescences* terminal, cymose paniculate, to 7 cm long, the peduncle 1.0–2.4 cm long, rigid, glabrous, the branches for the most part disposed as 2 pairs, the lowermost to 2.5 cm long, arcuate or angular ascending, the cymes few flowered, the branches often abnormal and swollen, to 0.4 cm wide. *Flowers* not seen. *Fruits* rotund, to 1.5 cm wide, blue, glabrous, the pyrenes oblong, to 1 cm long, truncate, conspicuously costate, often yellow green when dry, the calyx conspicuous; seeds blue black, with a T-shaped indentation as seen in cross section, often but one seed developing.

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[101] *Psychotria indigotica* Dwyer, spec. nov. *Arbores* ad 7 m altae ramulis glabris. *Folia* ovato-oblonga, 8.5–15.0 cm longa, 4–9 cm lata, venis lateralibus 5–7 in sicco albo-luteis, tenui-coriacea glabra; petiolis ad 3.5 cm longis; stipulis connatis crateriformibus, ad 0.2 cm longis, coriaceis glabris extus intusque puberulis dentibus nullis. *Inflorescentiae* terminales cymoso-paniculatae, ad 7 cm longae, pedunculo 1.0–2.3 cm longo, glabro ramulis pro maxime parte 2-jugis dispositis inferioribus ad 2.5 cm longis cymis paucifloris in ramis reductis dispositis. *Fructus* rotundi, ad 1.5 cm lati, ubi carne praesente azurei glabri seminibus indigoticis.

Psychotria indigotica is known only from Panama. It is so named because of its blue-black seeds.

45. **Psychotria insignis** Standley, Contr. U.S. Natl. Herb. 18: 130. 1916. TYPE: Panama, *Pittier 4410* (US, holotype; F, isotype).

Shrubs, the branchlets stout, angular, ferrugineous hirsute. *Leaves* ovate or oblong, 14–22 cm long, 7–9 cm wide, falcately acuminate, cordate at the base, the costa prominent beneath, the lateral veins 17–20, widely spreading and depressed arcuate, uniting submarginally to form a distinct undulate vein, stiffly chartaceous, concolorous, drying chocolate red; petioles to 5 cm long, ferrugineous hirsute; stipules deciduous, oblong, ca. 1.5 cm long, obtuse, ferrugineous hirsute. *Inflorescences* terminal, ferrugineous hirsute, 3 cm long, wider than long, the peduncle to 2 cm long, the branches 5, radiate, 1–2 cm long, the cymules densely flowered, usually 3 per branch, ca. 1 cm in diam., the bracts not seen. *Flowers* sessile, the calyx cup shaped, to 1 mm long, densely puberulent, the lobes oblong, 1.0–1.5 mm long. *Fruits* not seen.

This species is known only from the type collection in Panama.

SAN BLAS: Hills of Sperdi, near Puerto Obaldía, *Pittier 4410* (F, US).

46. **Psychotria liesneri** Dwyer.[102] TYPE: Panama, *Mori & Kallunki 3658* (MO, holotype).

Shrubs to 2 m tall, the ultimate branchlets slender, smooth, glabrous, drying ashen gray, the nodes well spaced, scarcely swollen. *Leaves* elliptic, 3.0–7.5 cm long, 1.7–2.0 cm wide, acute at the apex, acuminate, the acumen to 0.5 cm long, ultimately obtuse, acute at the base, the costa plane above and beneath, ca. 0.8 mm wide proximally, drying white above, the lateral veins ca. 8, occasionally with domatia in the axils, arcuate, uniting well below the margin to form an undulate vein, the smaller veins not visible, the margin scarcely callose, often delicately involute, thinly coriaceous, lustrous, glabrous, scarcely discolorous; petioles slender, to 1 cm long; stipules deciduous, triangular, to 3.5 mm long, obtuse. *Inflorescences* (in fruit) terminal, shorter than the leaves, puberulent; peduncle stiff, 1.3 cm long, slender, wiry, ca. 0.7 mm wide, terminated by 3 divergent branches to 2.3 cm long, wiry, the flowers presumably very few, divergent. *Flowers* not seen. *Fruits* subsessile, rotund, to 4 mm in diam., glabrous, drying black, the persistent ovarian disc often umbonate, subplane, to 1.7 mm in diam.

Psychotria liesneri occurs only in Panama. It is named in honor of Mr. Ronald Liesner, student of the flora of the Republic. It is closely allied to the small-

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[102] *Psychotria liesneri* Dwyer, spec. nov. *Frutices* ad 2 m alti, ramulis gracilibus glabris nodis bene distantibus. *Folia* elliptica, 3.0–7.5 cm longa, 1.7–2.0 cm lata, acuta costa utrinque plana venis lateralibus ca. 8 venis minoribus inconspicuis, tenui coriacea glabra; stipulis triangularibus obtusis. *Inflorescentiae* terminales pedunculo ca. 1.3 cm longo. *Fructus* rotundi, ad 4 mm lati, glabri, in sicco nigri.

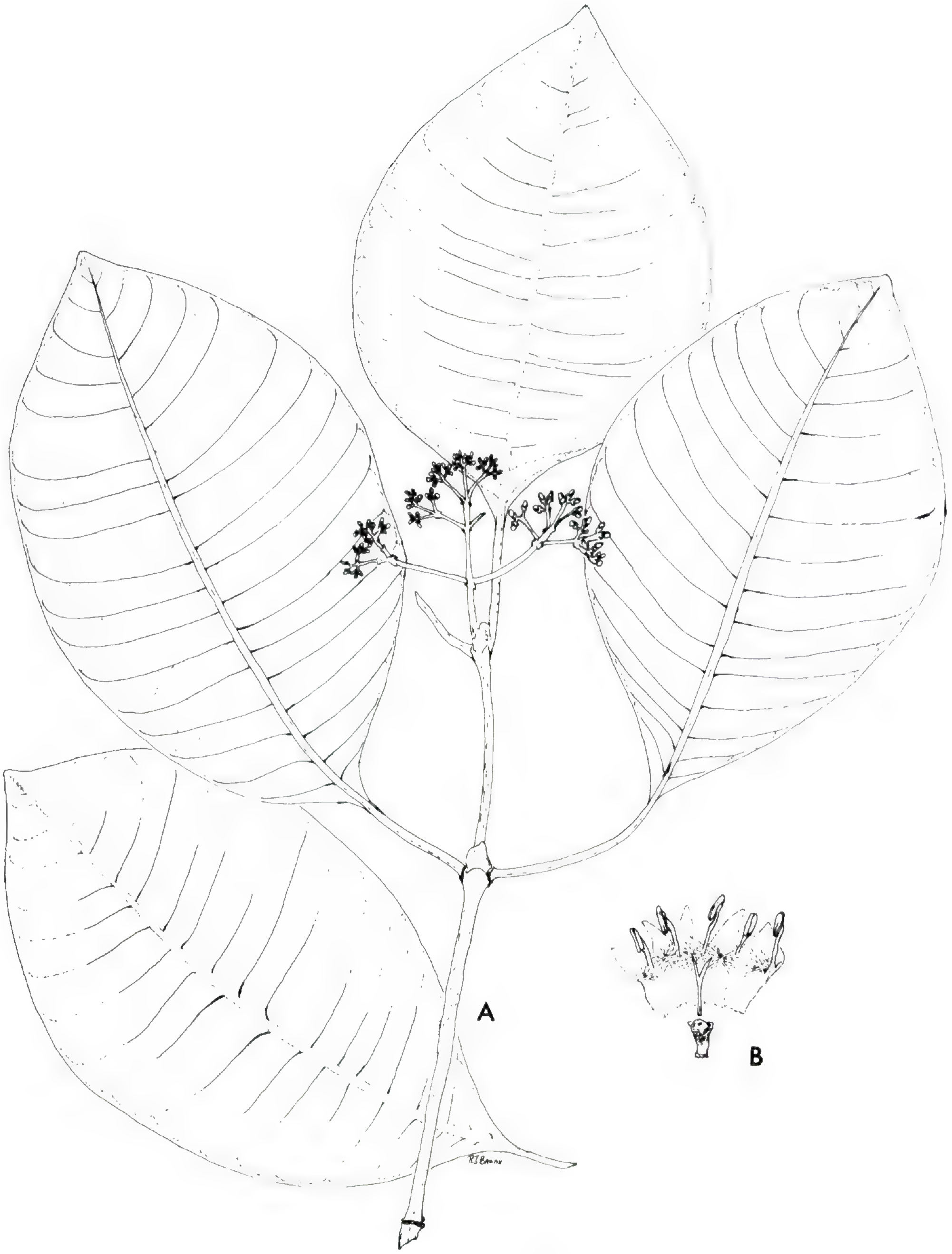

FIGURE 73. *Psychotria limonensis* Krause.—A. Habit (×½).—B. Flower, exploded to show interior (×2½). [After *Hayden 26*.]

leaved *P. chagrensis* Standley which has bilobed stipules and a much more delicate peduncle.

PANAMÁ: 8 mi S of Goofy Lake toward Cerro Jefe, 2200 ft, *Dwyer 7098* (MO). NE of Cerro Azul, premontane rain forest, *Mori & Kallunki 3658* (MO).

47. **Psychotria limonensis** Krause, Bot. Jahrb. Syst. 54: Beibl. 119: 43. 1916. TYPE: Costa Rica, *Pittier 12681* (US).—FIG. 73.

Subshrubs or *shrubs* to 3 m tall, the branchlets terete, ultimately angular, glabrous, smooth, the nodes well spaced. *Leaves* widely oblong, often oblong rotund, regularly ca. 2 times longer than wide, 11–30 cm long, 3.5–12.0 cm wide, widely deltoid at the apex, rarely acute and falcate, vaguely acuminate, the acumen deltoid, to 1.5 cm long, obtuse, basally cuneate, rarely truncate, often slightly inequilateral, the costa subplane or prominent beneath, often rubescent beneath, subperpendicular to widely arcuate, often rubescent, chartaceous, discolorous, fleshy, glabrous; petioles to 5 cm long, to 0.3 cm wide, glabrous; stipules free, compressed rotund, ca. 0.8 cm long, ca. 0.9 cm wide basally, coriaceous, glabrous. *Inflorescences* solitary, terminal, paniculate, subrotund, to 5.5 cm long, usually slightly wider than long; peduncles 1.5–2.0 cm long; bracts ovate or triangular, ca. 1 mm long, pubescent. *Flowers* ca. 3 mm long; hypanthium ca. 0.8 mm long, glabrous to puberulent, the calycine cup short with a few appressed, round glands within, the teeth minute, triangular, acute; corolla white or cream colored, the tube ca. 2 mm long, glabrous outside, villose within; stamens 5, the anthers oblong, ca. 0.9 mm long, the filaments short, ca. 1 mm long, villose, attached near the mouth; style slender, ca. 1 mm long; stigmas linear, ca. 1 mm long, the ovarian disc subrotund, ca. 0.4 mm long. *Fruits* subglobose or oblong, 6–7(–10) mm in diam., red at maturity, the pyrenes hemispherical, to 4 mm long, the ventral face plane, the dorsal face convex, the ribs 5 per pyrene.

Psychotria limonensis occurs in the lowland rain forests of Central America and northern South America.

BOCAS DEL TORO: Almirante, *Cooper 453* (F). Changuinola, *Lewis et al. 822* (GH, MO, UC, US). Water Valley, *Wedel 1407, 1770* (both MO). Old Bank Island, *Wedel 2137* (F, MO). CANAL ZONE: Fort Sherman, *Blum & Dwyer 2108* (MO). Coco Solo, *Duke 4264* (MO). Galena Point, *Dwyer 6626* (MO). Fort Sherman, *Dwyer & Robyns 136* (MO). Galena Point, *Dwyer & Robyns 160* (MO). BARRO COLORADO ISLAND: *Aviles 973* (F); *Croat 4014 A* (F, MO), *4109, 4113, 4552, 4918, 4922, 6176, 6465, 7097, 7363, 8717, 11972* (all MO); *Ebinger 129* (US); *Frost 5* (F); *Hayden 8, 26, 37* (all MO); *Robyns 65-30* (MO); *Shattuck 416* (F, MO), *973* (MO); *Starry 304* (F, MO); *Wilson 86* (F, MO); *Woodworth & Vestal 310* (F). COLÓN: Portobelo, *Ebinger 129* (MO, US). DARIÉN: Quebrada and Peje Swamp, *Bristan 1051* (MO). Without other locality, *Sexton s.n.* (MO). SAN BLAS: 3–4 hours by foot from Río Mulutupu, *Kirkbride 226* (MO). Molina near river, *Stier 39* (MO).

48. **Psychotria longipedunculata** Dwyer.[103] TYPE: Panama, *Croat 27621* (MO, holotype).

Shrubs to 1.2 m tall, smooth, angular, minutely puberulent when dry, the nodes well spaced. *Leaves* elliptic, to 18 cm long, to 9 cm wide, deltoid toward the apex, the costa prominulous above, prominent beneath, the lateral veins 12–

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[103] *Psychotria longipedunculata* Dwyer, spec. nov. *Frutices* ad 1.2 m alti ramulis minuto-puberulis. *Folia* elliptica, ad 18 cm longa, ad 9 cm lata, venis lateralibus 12–15, rigido-membranacea glabrata; petiolis ad 3 cm longis, saepe reflexis. *Inflorescentiae* axillares cymoso-paniculatae pedunculo 14–16 cm longo, floribus in caespitem terminalem oblongum, ad 3 cm longum dispositis bracteis lineari-subulatis, ad 1 cm longis. *Flores* sessiles cupula calycis 0.7 mm longa, lobis 5, 1.5 mm longis; corolla ad 2.5 mm longa, tubo extus glabro; antheris 0.8 mm longis. *Fructus* obovato-oblongi, ad 6.5 mm longi, costis linearibus aliquot glabri praediti.

15, arcuate, with 1–2 smaller and shorter veins between 2 lateral veins, the intervenal areas spreading reticulate, stiffly membranous, concolorous, shiny above, smooth, glabrate; petioles to 3 cm long, to 0.15 cm wide, often reflexed, glabrous; stipules not seen. *Inflorescences* axillary, cymose paniculate, the peduncle 14–16 cm long, to 0.18 cm wide, strongly ascending, rigid, wiry, the flowers disposed in an oblong terminal mass, to 3 cm long, to 3 cm wide; bracts linear subulate, to 1 cm long. *Flowers* (buds) sessile, the hypanthium short, the calycine cup 0.7 mm long, glabrous outside, eglandular and glabrous within, the lobes 5, oblong, 1.5 mm long, obtuse, petaloid; corolla to 2.5 mm long, the tube short, glabrous outside, villosulose near the filament attachment, the lobes 5, shorter than the tube, cucullate; stamens 5, the anthers oblong, 0.8 mm long, obtuse, the filaments short; ovary disc oblong hemispherical or compressed-rotund, 0.5–0.65 mm long, the style short, the stigmas oblong. *Fruits* obovate oblong, often slightly falcate, to 6.5 mm long, obtuse toward the apex and base, glabrous, the ribs linear, the raphides abundant.

Psychotria longipedunculata is known only from Panama. Its extraordinary elongate peduncles distinguish it from all other Central American *Psychotria*.

VERAGUAS: Valley of Río Dos Bocas, 15.6 km NW of Santa Fé, road between Escuela Agricola Alto Piedra and Calovebora, *Croat 27621* (MO).

49. **Psychotria luxurians** Rusby, Mem. Torrey Bot. Club 6: 50. 1896. TYPE: Bolivia, *Bang 1741* (US, holotype).

P. berteriana subsp. *luxurians* (Rusby) Steyermark, Mem. New York Bot. Gard. 23: 534. 1972.

Trees or *shrubs* to 25 m tall, the branches terete, smooth, glabrous, distinctly hollow, often constricted below the nodes, the latter well spaced, the branchlets ultimately subplane. *Leaves* oblong, often widely so, elliptic, 8.6–24.5 cm long, 3.2–15.0 cm wide, tapering obtusely or deltoidly at the apex, acuminate, occasionally inequilateral, the costa prominulous above, prominent or subplane beneath, to 0.22 cm wide proximally, the lateral veins 10–18, arcuate, prominulous and often evanescent above, prominent beneath, the intervenal areas with smaller pinnatiform veins, papyraceous, usually discolorous, glabrous above, often puberulent on the veins and the costa beneath; petioles to 4 cm long, to 0.2 cm wide, usually glabrous, occasionally puberulent; stipules free, oblong or oblong rotund, often compressed and wider than long, 5–7 mm long, 3.7–8.0 mm wide, obtuse, rounded, often undulate or vaguely retuse, appressed setose within. *Inflorescences* terminal, shorter than or exceeding the terminal leaves, to 22 cm long, paniculate, usually pyramidal paniculate; peduncle 1–6 cm long, 0.1–0.4 cm wide, subplane, angular, puberulent, the lowermost branches opposite, to 7 cm long, usually arcuate ascending or perpendicular, the axis with several paniculate branches, ultimately bearing densely flowered cymules; bracts of the primary branches linear oblong or subulate, to 5 mm long; hypanthium and calycine cup to 1.5 mm long, the calycine cup ca. 0.5 mm long, carnose, glabrous, the teeth widely deltoid, unequal, to 0.5 mm long, usually with a minute gland at the junction of 2 teeth; corolla tube cylindrical, to 3 mm long, glabrous outside, the lobes 5, ca. 1 mm long, villose within; stamens 5, the anthers ca. 1 mm long,

obtuse, the filaments crassate, short; stigmas 2, subulate, ca. 1.2 mm long, villose, the style ca. 1.5 mm long. *Fruits* sessile, oblong, ca. 3 mm long, glabrous, the pyrenes with the ventral face of the endocarp flat and with a fissure, the dorsal face with 5–6 ribs.

Psychotria luxurians ranges from Panama south to Bolivia.

CHIRIQUÍ: Cerro Colorado, 50 km N of San Felix, 1200–1500 m, *Mori & Dressler 7801* (MO). COCLÉ: El Valle, *Croat 13396* (MO). Cerro Pilón near El Valle, 700–900 m, *Duke 12125, 12126* (both MO); *Duke & Dwyer 13926* (MO). Cerro Pilón, *Duke & Lallathin 14972* (MO). El Valle, *Dwyer 1904, 5641* (both MO). Cerro Pilón, ca. 2900 ft, *Dwyer 8342* (MO). 8.5 mi from Club Campestre toward La Mesa, *Dwyer 10559* (MO). El Valle, foot of Cerro Pilón, *Dwyer & Correa 7989* (GH, MO, US). Cerro Gaital Caracoral, 3100 ft, *Dwyer & Correa 8872* (MO). El Valle, *Folsom 3117* (MO). Summit Alto Clavario, 900 m, *Folsom & Robinson 2413* (MO). La Mesa above El Valle, *Gentry 7435* (MO). El Valle de Antón, *Luteyn 1215* (MO). El Valle to La Mesa, *Spellman et al. 558* (MO). COLÓN: Forested area near Guasimo, *Croat 9949* (MO). Santa Rita Ridge, *Croat 13838, 15311* (both MO); *Croat & Porter 15598* (MO); *Dwyer 8559* (MO); *Dwyer et al. 9003* (MO). Near Agua Clara rainfall station, *Foster 1750* (MO). Santa Rita Ridge, *Gentry 1873* (MO). DARIÉN: Cerro Pirre, 750–1030 m, *Duke 5332* (MO). Upper Río Membrillo and Camp 7, road to San Blas, 100–800 m, *Duke 10892* (MO). Cerro Pirre, 2500–4500 ft, *Duke & Elias 13787* (MO). Cuasí-Caná Trail, Cerro Campamiento, E of Tres Bocas, *Kirkbride & Duke 1249* (MO). Cuasí-Caná Trail, Chepigana, *Terry & Terry 1448, 1524* (both MO). PANAMÁ: Campo Tres, 5 km NE of Altos de Pacora, *Busey 826* (MO). 3 mi N of Cerro Azul, *Croat 11593* (MO). Cerro Jefe, *Croat 13058* (MO). Altos de Pacora, 10 mi beyond Goofy Lake, *Croat 14417* (MO). 4–6 mi above Goofy Lake, *Croat 15196, 15234* (both MO). Pipeline Road, 4 mi from main gate, Gamboa, *Croat 33728* (MO). Cerro Azul, *Dwyer 4342* (MO). NE slope of Cerro Jefe, *Dwyer & Blum 3255* (MO). Cerro Jefe, *Dwyer & Gauger 7354* (GH, MO, UC, US). Cerro Campana, *Dwyer & Kirkbride 7843* (MO). Cerro Jefe, *Elias & Hayden 1809* (GH, MO). El Llano Carti Road, 7.8 km N of Panamerican Highway, *Folsom 3563* (MO); Same locality, 14 km N of Panamerican Highway, *Folsom et al. 1484* (MO). Between Cerro Azul and Cerro Jefe, *Foster 1171* (MO). Cerro Jefe, *Gentry 2126* (MO). Cerro Campana, *Hayden 119* (MO). Cerro Jefe, *Hayden 1001* (MO). Río Pina and Río Media divide, *Johnston 1807* (MO). Cerro Jefe, *Kirkbride & Crebbs 37* (MO). Road to Cerro Jefe, *Mori & Kallunki 2768* (MO). El Llano-Cartí Road, 10.8 km from Interamerican Highway, *Mori & Kallunki 4135* (MO). Cerro Jefe, *Tyson et al. 3222, 3255, 4435* (all MO). VERAGUAS: Cerro Tute, cloud forest, 1000 m, *Mori 6258* (MO). Road to Calovebora, *Mori & Kallunki 5356* (MO).

50. **Psychotria macrophylla** Ruiz & Pavón, Fl. Peruv. Chil. 2: 56. 1799. TYPE: "Nemoribus versus Pillao ad Iscutunam," Huanuco, Peru, *Ruiz & Pavon*, not seen.

P. anomothyrsa Schum. & Donnell Smith, Bot. Gaz. 35: 3. 1903. TYPE: Guatemala, *Von Tuerckheim 7909*, not seen.
P. tolimensis Wernh., Kew Bull. Miss. Inform. 68. 1914. TYPE: Colombia, *Sprague 237* (K).
Hoffmania striata Rusby, Descr. S. Amer. Pl. 134. 1920. TYPE: not seen.
P. macrophylla Ruiz & Pavón var. *angustissima* Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 203. 1940. TYPE: Panama, *Terry & Terry 1597* (F, holotype).

Shrubs to 4 m tall, the branchlets subterete but ultimately angular, smooth, glabrate, the nodes 2–6 cm apart, the pith porate. *Leaves* strongly ascending, elliptic or oblong, often narrowly oblong, rarely oblong rotund, often somewhat falcate, 9–45 cm long, 3–10 cm wide, deltoid to acute at the apex, usually somewhat contracted into a short acumen, the latter to 2 cm long, basally acute or cuneate, the costa subplane or immersed above, prominulous and occasionally grooved beneath, the lateral veins ca. 13, arcuate, often widely so, often with 1–2 smaller veins between 2 adjacent lateral veins, scarcely prominulous, papyraceous, rarely membranous, glabrous or with small, well spaced, strigose, white hairs above and beneath; petioles 1–7 cm long, flexuous or stiff; stipules (fide

Standley, only one seen), free, caducous, short, broad, apiculate. *Inflorescences* axillary, paniculate, to 18 cm long, to 9 cm wide at the base, the peduncles 1.5–14.0 cm long, 1.2 mm wide, glabrate to pubescent, the hairs variable, the branches opposite, rarely verticillate, well spaced, usually 2–3 pairs in larger inflorescences. *Flowers* with the hypanthium subrotund, ca. 0.5 mm long, villosulose outside, the calycine cup ca. 0.8 mm long, glabrous and eglandular within, the calycine lobes scarcely visible or as 5 triangular teeth, ca. 0.4 mm long; corolla white or yellow, short, to 4 mm long (including lobes), glabrous outside, villose within; stamens 5, the anthers oblong, ca. 1.2 mm long, the filaments short; style ca. 2.2 mm long, the stigmas 2, small, ca. 0.35 mm long. *Fruits* subrotund or subovate, drying white, 3.5–5.0 mm in diam., the pyrenes 2, strongly compressed, the dorsal face of each pyrene 4–5 costate, the ribs conspicuous.

Psychotria macrophylla ranges from Mexico to Bolivia. Despite the fact that narrow-leafed collections can be easily segregated, I have found too much intergradation in leaf width to favor retention of var. *angustissima* Standley. A collection of particular interest is *Mass & Dressler 1703* from El Llano-Carti Road, in which the inflorescences are almost sessile.

BOCAS DEL TORO: Río Teribe, *Kirkbride & Duke 512* (MO). Changuinola, *Lewis et al. 969* (GH, K, MO, UC, US). Chiriquicito to 5 mi S of Río Guarumo, *Lewis et al. 2099* (GH, MO, US). Water Valley, Chiriquí Lagoon, *Wedel 1572* (MO). Nievecita, *Woodson et al. 1840* (MO). CHIRIQUÍ: Bajo Chorro, Boquete, *Davidson 229* (MO). Cerro Horqueta, *Duke & Kirkbride 108* (MO); *Duke et al. 13643* (MO). Boquete, *Dwyer & Hayden 7663* (GH, K), *7676* (MO). El Boquete, *Maxon 4934* (US). Cerro Colorado, 50 km N of San Félix, 1200–1500 m, *Mori & Dressler 7859* (MO). Las Signas Camp, *Pittier 3271* (US). Upper Río Gariche, *Seibert 360* (MO). Chiriquí Viejo Valley, *White 87* (MO). Río Caldera, *Wilbur et al. 11070* (MO). Bajo Mono, along Río Caldera, *Woodson et al. 1017* (MO). COCLÉ: Cerro Pilón, *Croat 13468* (MO). La Mesa, *Dwyer 8057* (MO). Cerro Pilón, *Dwyer 8634* (MO). El Valle, *Dwyer & Correa 7932* (GH, MO, US). Cerro Gaital Caracoral, *Dwyer & Correa 8863* (MO). La Pintada, *Hunter & Allen 542* (MO). Boca del Toabre, *Lewis et al. 5533* (MO). Cerro Pilón, 5 km NE of El Valle, *Mori et al. 6558* (MO); *Porter et al. 4617* (COL, MO, SCZ, UC, VEN). COLÓN: Río Guanche, ca. 2.5 km upriver from bridge to Portobelo, *Mori & Kallunki 3707* (MO). Río Guanche, 6 km S of Portobelo, *Nee & Gentry 8687* (MO). DARIÉN: El Real, *Bristan 108* (MO). Río Yape, *Bristan 1370* (MO). Río Pirre, *Bristan 1486* (MO). Cerro Pirre, *Duke 5292, 6555* (both MO). Cerro Campamiento, *Duke 15652, 15672, 15718* (all MO). Cocalito, *Dwyer 2162, 2194* (both MO). S slope of Cerro Tacarcuna, 1250–1450 m, *Gentry & Mori 13940* (MO). Top of W ridge, Cerro Tacarcuna, Elfin Forest, 1800–1850 m, *Gentry & Mori 14021* (MO). 0–2 mi E of Tres Bocas, *Kirkbride & Duke 1182* (MO). Cerro Campamiento, *Kirkbride & Duke 1219, 1356* (both MO). Caná-Cuasi Trail, Chepigana, *Terry & Terry 1530* (MO). Caná Cuasi Trail, *Terry & Terry 1597* (F). PANAMÁ: Cerro Campana, *Correa & Dressler 1016* (MO); *Croat 14739* (MO). Cerro Jefe, *Duke 15238* (MO). Cerro Campana, *Dwyer & Kirkbride 7860* (MO); *Kirkbride 249* (MO); *Kirkbride & Hayden 288, 301* (both MO). Cerro Campana, *Lewis et al. 3090* (MO, UC); *Luteyn 1014* (MO). El Llano-Carti Road, 400 m, *Maas & Dressler 1703* (MO). Cerro Campana, *Mori & Kallunki 3541* (MO). VERAGUAS: NW of Santa Fé, 1 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 4867* (MO). Lower slopes of Cerro Tute, NW of Santa Fé, 2 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5238* (MO). NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, Valley Río dos Bocas, *Mori et al. 3824* (MO). Road from Santa Fé to Calovebora, 16 km from Santa Fé, Atlantic slope near Río Caloveborita, *Mori et al. 6692* (MO).

51. **Psychotria magna** Standley, Contr. U.S. Natl. Herb. 18: 131. 1916. TYPE: Panama, *Pittier 4092* (US, holotype; photo, F).

P. compressicaulis Schum., Bot. Jahrb. Syst. 54: Beibl. 119. 44. 1916.

Shrubs. *Leaves* elliptic, oval or elliptic oval, 18–25 cm long, 8.0–11.5 cm wide, tapering obtusely or acutely at the apex, the acumen well defined, narrowly tri-

angular, to 2.5 cm long, cuneate at the base, the lateral veins 17–20, minutely puberulent beneath, the blade papyraceous; petioles 2–4 cm long, lignose; stipules not seen. *Inflorescences* terminal, cymose, paniculate, to 10 cm long, to 10 cm wide. *Flowers* with the calyx and hypanthium ca. 1.5 mm long, the cup undulate and ciliolate, the teeth absent; corolla yellowish white, 3–4 mm long, glabrous outside, densely villose within at the mouth, the lobes 1.5 mm long; anthers 5, minute, oblong, 0.7 mm long, obtuse. *Fruits* not seen.

Psychotria magna is known only from Costa Rica and Panama.

COLÓN: Loma de la Gloria, Fató, *Pittier 4092* (F, US).

52. **Psychotria marginata** Swartz, Nov. Gen. Pl. Prodr. 43. 1788. TYPE: Jamaica, *Swartz*, not seen.

Uragoga marginata (Swartz) Kuntze, Rev. Gen. Pl. 2: 960. 1891.

Shrubs to 3 m tall, the branchlets terete, smooth, glabrous, the nodes well spaced. *Leaves* elliptic, oblong or obovate oblong, rarely oblong rotund, to 20 cm long, to 6.8 cm wide, rounded or deltoid at the apex, acute to attenuate acute at the base, rarely truncate, the costa plane and often grooved to prominulous above, prominulous beneath, often subplane, to 1.3 mm wide proximally, the lateral veins 9–15, arcuate, prominulous above and beneath, occasionally minutely pubescent or farinose beneath, often with domatia in the axils, these often mammiform, 1 mm long, puberulent, the intervenal areas usually spreading reticulate below, evanescent above, papyraceous, concolorous, often drying metallic gray or brown; petioles to 2.3 cm long, to 0.17 cm wide, glabrous; stipules free, usually appressed, oblong, 1.2–1.6 cm long, acute or obtuse or tapering into an obtuse tip, scarious, glabrous. *Inflorescences* terminal, conspicuously open and spreading, solitary, paniculate, 6–15 cm long, the peduncle slender, to 8 cm long, the branches opposite, usually disposed as 3 well-spaced pairs, the lowermost to 8 cm long, strongly divergent; bracts triangularly ovate, to 1 mm long, glabrous or pubescent. *Flowers* with pedicels to 2 mm long, the calycine cup ca. 0.4 mm long, thickly petaloid, eglandular within, glabrous outside, the teeth almost absent or widely triangular, unequal, ciliolate, shorter than the calycine cup; corolla yellow, yellow green, or white, the tube cylindrical, ca. 3 mm long, glabrous outside, pilose within, the lobes oblong, 0.4–1.8 mm long, glabrous or with tufts of hairs proximally; stamens 5, included, the anthers narrowly oblong, 1.0–1.2 mm long, obtuse; ovarian disc subglobose, to 0.5 mm long, the style shorter than the corolla tube, somewhat dilated above, the stigmas to 0.7 mm long. *Fruits* rotund, to 4 mm long, glabrous, the calycine cup usually persistent, minute, the pyrenes plane on the dorsal face, the convex face 4–5-ribbed, the albumen ruminate on the ventral face.

Psychotria marginata is common throughout tropical America and is well collected, perhaps more so than any other species of Rubiaceae in Panama. In Darien the species is known as "Gorojito" (*Duke 14271*).

BOCAS DEL TORO: 1.5 m W of Almirante, *Blum 1361* (MO). Island of Bocas del Toro, *Durkee 71-133* (MO). Río Changuinola, Changuinola, *Dwyer 4400* (MO). Cerro Bonyic, above Quebrada Huron,

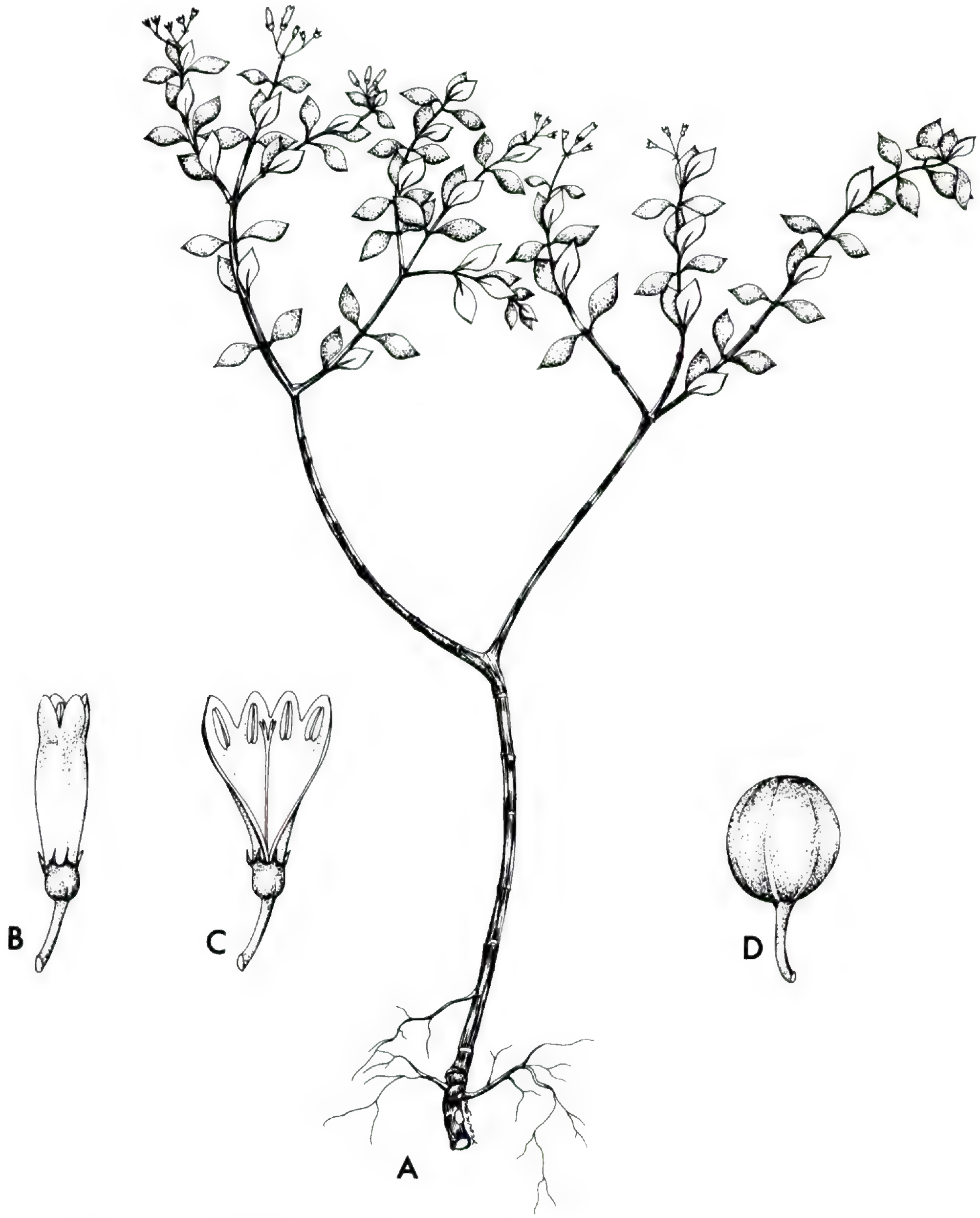

FIGURE 74. *Psychotria maxonii* Standley.—A. Habit (×½).—B. Flower (×5).—Flower, opened to show interior (×5).—Fruit (×5). [After *Mori & Bolten 7589*.]

Kirkbride & Duke 591 (MO). Almirante, *McDaniel 5129* (MO). Chiriquí Lagoon, *Wedel 1079, 1191, 1347* (all MO). Water Valley, *Wedel 1722* (MO). Old Bank Island, *Wedel 2011, 2160* (both MO). CANAL ZONE: Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16343* (MO). 2 mi from Gatún Locks, *Blum 1494* (MO). Fort Sherman, Skunk Hollow, *Blum & Dwyer 2107* (MO). Galena Point, *Blum & Dwyer 2148, 2152* (both MO). Gamboa Pipeline on TTC lands, *Correa 483* (MO). E of Gamboa, *Croat 4784* (MO). Las Cruces Trail, Madden Forest, *Dwyer 1959* (MO). Fort Sherman site, USATTC, *Dwyer 8591* (MO). George Greene Memorial, *Dwyer & Hayden 6* (MO). Fort Sherman, Skunk Hollow, *Dwyer & Robyns 135* (MO). Chagres, *Fendler 64* (MO). Pipeline Road, *Fosberg 55254*

(US). Las Cruces Trail, *Hunter & Allen 461* (MO). Pipeline Road, NE of Gamboa, *Kennedy 2334* (MO). Pipeline Road, Agua Salud, *Kennedy & Andrews 1903* (MO). Colon Highway, Road to Fort Sherman, *Lazor & Blum 5364* (MO). Shore of Gatún Lake, *Lewis et al. 1830* (GH, MO, US). Madden Forest Preserve, Las Cruces Trail, *Lewis et al. 5320* (COL, MO, SCZ, UC, VEN), *5340* (MO, SCZ, UC). Road S-8 at Quebrada La Furnia, 1½ km S of mouth of Chagres, *Nee 8637* (MO). Pipeline Road, 9 km NW of Gamboa, *Nee 9598* (MO). Pipeline Road, 19 km NW of Gamboa, *Nee & Smith 11105* (MO). Fort Sherman to Fort San Lorenzo, *Porter et al. 4993* (MO, SCZ, UC, VEN). Splice S–16 and S–49, Río Indio, *Steyermark & Allen 17456* (MO). 6 mi N of Gamboa, *Tyson 1440, 1517* (both MO). Fort Sherman, *Tyson & Blum 1659* (MO). 1 mi N of Summit, *Tyson & Blum 2762* (MO). 12 mi S of Colón on Río Providencia, *Tyson & Blum 3978* (MO). Fort Sherman, Pena Road, *Tyson & Chu 1711* (MO). Pipeline Road, *Witherspoon & Witherspoon 8630* (MO). BARRO COLORADO ISLAND: *Croat 4033, 4099, 4105, 4303, 5083, 5678, 5681, 5775, 5838, 5843, 6394, 6519, 6548, 7134, 7325, 7718, 7838, 10315* (all MO); *Ebinger 615* (MO); *Hayden 14, 28, 129* (all MO); *Knight 69-4* (MO); *McDaniel 5012* (MO); *Robyns 65-5, 65-10* (both MO), *65-27* (MO, US); *Shattuck 116, 274, 932* (all MO); *Starry 105* (MO); *Stimson 5283* (MO); *Wetmore & Abbe 3* (MO); *Woodworth & Vestal 653* (MO). COCLÉ: El Valle, *Allen 1187* (MO). COLÓN: Rio Guanche, *D'Arcy 9686* (MO). Portobelo, *Ebinger 108* (US). Vicinity of Achiote, *Folsom 3858, 3860* (both MO). 6 mi SW of Portobelo, *Luteyn 1416* (MO). 4 km NW of Salamanca, 13 km NE of Buenos Aires, *Nee 9091* (MO). DARIÉN: Río Yapé, *Bristan 1386* (MO). Río Chico across from Boca de Tesca, *Duke 5223* (MO). Summit Camp, between Sasardi and Morti, *Duke 10042, 10048* (both MO). Camp Clarita, near Chucunaque-Bayano Divide, *Duke 15538* (MO). Cerro Campamento, S of Cerro Pirre, *Duke 15960* (MO). Río Ganglon, *Duke & Bristan 362* (MO). Río San Jose, *Duke & Bristan 396* (MO). Río Pirre, *Duke & Bristan 8296* (MO). Paya and Palo de los Letras, *Duke & Kirkbride 14306 A, 14070, 14271* (all MO). Tacarcuna Massif, above Rio Pucro, *Gentry et al. 16958* (MO). Between Tres Bocas and Cerro Campamiento, *Kirkbride & Duke 1357* (MO). Rio Tuquesa, Tuquesa Mining Company, *Mori 7032, 7044* (both MO). Trail from Paya to Pucro, *Stern et al. 416* (MO). Cana-Cuasi Trail, Chepigana, *Terry & Terry 1422* (MO). 3 mi N of Santa Fé, *Tyson et al. 4633, 4692* (both MO). LOS SANTOS: Loma Prieta, Cerro Grande, *Lewis et al. 2201* (COL, MO, UC, VEN). 16 mi S of Macaracas, *Tyson et al. 2902* (MO). PANAMÁ: Río la Maestra, *Allen 11* (MO). Cerro Campana, *Correa et al. 1015* (MO). Between Panama and Chepo, *Dodge et al. 16673* (MO). Jenine, *Duke 3886* (MO). Río Pita, *Duke 4803* (MO). Piria-Canasas Trail, *Duke 14342* (MO). Cerro Azul, *Dwyer 2105, 2189* (both MO). Cerro Jefe, *Dwyer 8526* (MO). Río Pasiga to above waterfall, *Gentry 2294* (MO). Río Espave to Rio Agua Clara, *Gentry 3764* (MO). Cerro Trinidad, *Kirkbride & Duke 1648* (MO). Goofy Lake to Cerro Jefe, *Lewis et al. 253* (GH, K, MO, UC, US). Chimán, *Lewis et al. 3248* (MO, UC, VEN). Arraijan, *Woodson et al. 772* (MO). SAN BLAS: Río Diabolo and Río Acuatí, *Duke 14869* (MO). Headwaters of Río Cuadi, Camp Diabolo, *Duke et al. 3644* (MO). VERAGUAS: Isla de Coiba, *Collenette 469* (MO).

53. **Psychotria maxonii** Standley, Proc. Biol. Soc. Wash. 37: 53. 1924. TYPE: Costa Rica, *Maxon & Harvey 8250* (US).—FIG. 74.

Epiphytic *subshrubs*, ericoid in appearance, the branchlets slender, terete, smooth, glabrous, the nodes relatively well spaced. *Leaves* oblong to elliptic, occasionally trapeziform elliptic, 0.8–1.8 cm long, 0.25–0.55 cm wide, acute or obtuse, often acuminate, the acumen to 0.6 mm long, acute at the base, the costa evanescent above, plane and almost evanescent beneath, the lateral veins not visible, fleshy, drying papyraceous, dark brown above, buff colored beneath, smooth, glabrous, marginate; petioles to 0.2 cm long, glandular shiny; stipules intrapetiolar, connate, the sheath scarious, to 1.5 mm long, truncate, with fimbriate appendages outside. *Inflorescences* terminal and axillary, cymose, shorter than or slightly longer than uppermost leaves, glabrous, the peduncle 3–7 mm long, usually terminated by 3 primary radiate branches with 3–5 flowered cymes, the bracts and bracteoles subulate, minute. *Flowers* short pedicellate; hypanthium rotund to oblong, 0.6–0.7 mm long, glabrous, the calycine cup almost indistinguishable, eglandular within, the teeth 4, deltoid, 0.35–0.60 mm long, thickly petaloid; corolla white, the tube narrowly cylindrical, ca. 2.5 mm long, ca. 0.65 mm wide, petaloid, glabrous except for a few hairs at the point of filament

attachment, the lobes oblong, ca. 1 mm long, ca. 0.6 mm wide at the base, acute; stamens in part exserted, the anthers oblong, ca. 0.3 mm long, obtuse, the filaments short, attached at the upper ⅓ of the tube; stigmas 3–4, slender, to 0.5 mm long, the style slender, ca. 2.5 mm long, the ovary 3–4-celled, the ovules obovate oblong, plano convex. *Fruits* pedicellate, the pedicels to 3 mm long, oblong rotund, ca. 3 mm in diam., smooth, shiny, glabrous, waxy, pink or orange, the ribs few, not prominent.

Psychotria maxonii is known only from Panama and Costa Rica. The fimbriate stipules readily separate it from the other epiphytic *Psychotria* in Middle America.

BOCAS DEL TORO: Cerro Horqueta, 6000 ft, *Allen 4984* (NY); *Hagen & Hagen 2152* (NY). Elfin Forest at divide on Chiriquicito Caldera Trail, *Kirkbride & Duke 981* (MO). Cerro Hornitos, 40 km NW of Gualaca, 2238 m, *Mori & Bolten 7503* (MO, US). N of San Félix at Chiriquí-Bocas del Toro border, road to Cerro Colorado Copper Mine, 5000–5500 ft, *Folsom et al. 4680* (MO); *Mori & Kallunki 5923* (MO). VERAGUAS: Cerro Tute, 750–1000 m, *Mori et al. 7589* (MO).

54. **Psychotria micrantha** H.B.K., Nov. Gen. Sp. Pl. 3: 363. 1819. TYPE: "Am. Austr.," *Kunth* (B, not seen; photo, MO).

Mapouria micrantha (H.B.K.) Wernh., Kew Bull., 1914: 69. 1914.
Psychotria hindsii Standley, Publ. Field Columbian Mus. Bot. Ser. 7: 97. 1930. TYPE: Colombia, *Hinds s.n.* (K, holotype, not seen).
P. rufescens of authors, not H.B.K. ex R. & S.

Shrubs or *trees* to 5 m tall, the branchlets often with pith hollow, terete but ultimately compressed and angular, usually densely rufous villosulose. *Leaves* oblong lanceolate, 12–30 cm long, 5–12 cm wide, acute, rarely obtuse at the apex, often acuminate to 1.5 cm long, basally cuneate to acute, often attenuate at the base, the costa prominulous above, prominent beneath, to 0.3 cm wide proximally, the lateral veins 18–26, laxly arcuate, papyraceous, concolorous, the hairs minute, white, strigose on the upper surface, densely rufous villosulose beneath, usually barbate along the costa and the lateral veins; petioles stout, ca. 2 cm long, to 0.3 cm wide, slightly winged (decurrent petiole), densely rufous puberulent; stipules free, usually persistent at the terminal nodes, appressed, deltoid to ovate, 1.0–1.5 cm long, ca. 0.7 cm wide at the base, rufous hirsute, the 2 lobes 1–5 mm long. *Inflorescences* either terminal or terminal and axillary, shorter or longer than the uppermost leaves; peduncle 6–7 cm long, rufous pubescent, terminated by ca. 6 primary radially disposed branches or occasionally with tertiary branches likewise disposed, the ultimate cymules conglomerate, 0.4–1.0 cm in diam.; bracts subtending the primary branches narrowly subulate, to 0.5 mm long, the bracteoles of the lesser branches similar in shape. *Flowers* with the hypanthium oblong, ca. 0.3 mm long, densely villose, the hairs white, to 0.4 mm long, the calycine cup ca. 0.5 mm long, glabrous within, lacking glands within, the teeth 5, compressed oblong, ca. 0.25 mm long; corolla white, the tube broadly cylindrical, ca. 2.2 mm long, glabrate outside, villose on the upper ⅔ within, the lobes 5, oblong, ca. 1.8 mm long, villose, somewhat cucullate apically; stamens 5, the anthers oblong, ca. 1.5 mm long, the filaments slender, attached at the middle of the tube; ovarian disc hemispherical, ca. 0.5 mm long, shiny black, the stigmas

to 1.3 mm long. *Fruits* globose to ellipsoid, ca. 4 mm in diam., pubescent, red; pyrenes with ventral face flat, 5-ribbed on the dorsal surface.

Psychotria micrantha occurs in Nicaragua, Panama, Colombia, Venezuela, Ecuador, and Peru. The fact that the pyrenes are pubescent is noteworthy. The common names used by the Cuna Indians of the San Blas (*Duke 8466*) are "Uasicuit" and "Esuargit."

BOCAS DEL TORO: Almirante, *Blum 1385* (MO); *McDaniel 5051* (MO). Chiriquí Lagoon, *Wedel 1163* (MO). Water Valley, *Wedel 1809* (F, MO). Old Bank Island, *Wedel 1869* (MO). Little Boca, Chiriqui Lagoon, *Wedel 2508* (F, MO). BARRO COLORADO ISLAND: *Croat 6235, 16583* (both MO); *Shattuck 1115* (F, MO). CANAL ZONE: Cerro Gordo, Road 15 B, *Croat 15125* (F, MO). Fort Sherman, *Croat 15361* (MO). Madden Dam, *Dwyer & Lallathin 8822* (MO). Curundu, *Tyson & Blum 4458* (MO). COCLÉ: Cerro Gaital Caracoral, *Dwyer & Correa 8882* (MO). COLÓN: N side of Río Guanche, ½ mi upstream from Puerto Pilón and Portobelo Road, *Nee 7104* (MO). Palmas Bellas, *Thoms 36* (MO). DARIÉN: Río Pirre, *Croat & Porter 15532* (MO). Río Chucunaque and Río Canclones, *Duke 5114* (MO). Río Chico, *Duke 5217* (MO). Paya, *Stern et al. 176, 222* (both MO). El Real, *Stern et al. 611* (MO). PANAMÁ: Camino de Cruces, *Caceres 16* (MO). Cerro Campana, 2 mi above Interamerican Highway, *Croat 12045* (MO). Tocumen, *Dwyer s.n.* (MO). Rio Tocumen, *Standley 26604* (G). SAN BLAS: Mulatuppu (Rio Ibedi), *Duke 8466* (MO). Mainland opposite Ailigandi, *Dwyer 6838* (MO). Río Mulatuppu, *Elias 1729* (GH, MO, US). Mainland opposite Ailigandi, *Lewis et al. 156* (F, GH, K, MO).

55. **Psychotria microdon** (DC.) Urban, Symb. Antil. 9: 539. 1928.

Rondeletia microdon DC., Prodr. 4: 408. 1830. TYPE: Cuba, *De la Ossa,* not seen.
Psychotria pinularis Sesse & Moc., Fl. Mex., ed. 2: 57. 1894. TYPE: Vicinity Porto de la Aquadilla, Mexico, *Sesse & Mocino,* not seen.

Shrubs or *trees* to 5 m tall, the branchlets terete, rigid, smooth, often drying white or olive white, disposed at right angles to the twigs, the nodes often crowded, the leaf-bearing nodes swollen. *Leaves* oblong or obovate, 5–9 cm long (or longer), 2–4 cm wide, obtuse to deltoid at the apex, acute to attenuate acute at the base, the costa prominent above and beneath, the lateral veins 5–6, arcuate, slender; petioles slender, to 1.5 cm long; stipules connate, persistent, triangular, to 2 mm long, mucronate or briefly bilobate, puberulent or glabrate outside, setiferous at the base within. *Inflorescences* terminal, cymose corymbose, not exceeding the uppermost leaves, the peduncle absent and then with 3–5 ascending branches to 7(–9) cm long, or pedunculate, the peduncle to 5 cm long, slender, ca. 0.12 cm wide, terminating in (2–)5 radially disposed branches, glabrous or puberulent, the flowers few; bracts ovate triangular, to 1.5 mm long, with appressed hairs outside and a large gland at the base within. *Flowers* subsessile, distylous, the hypanthium short, the calycine cup urceolate, inflated, scarious to carnose, glabrous and eglandular inside, minutely puberulent outside, the teeth scarcely evident or the margin merely undulate; corolla cylindrical, to 8 mm long (in bud), somewhat constricted toward the base, petaloid, glabrous inside and out, the tube oblong subrotund or ovate oblong, 3–4 mm long, obtuse, venose, occasionally fleshy; stamens 4–5(–7), the anthers oblong, 1.8–2.2 mm long, the filaments short, attached above the middle of the tube; style slender, 1.0–2.5 mm long, the stigmas sagittate or subulate, longer than the style, the ovarian disc compressed rotund, ca. 0.3 mm long, ca. 1 mm in diam. *Fruits* subrotund, to 6

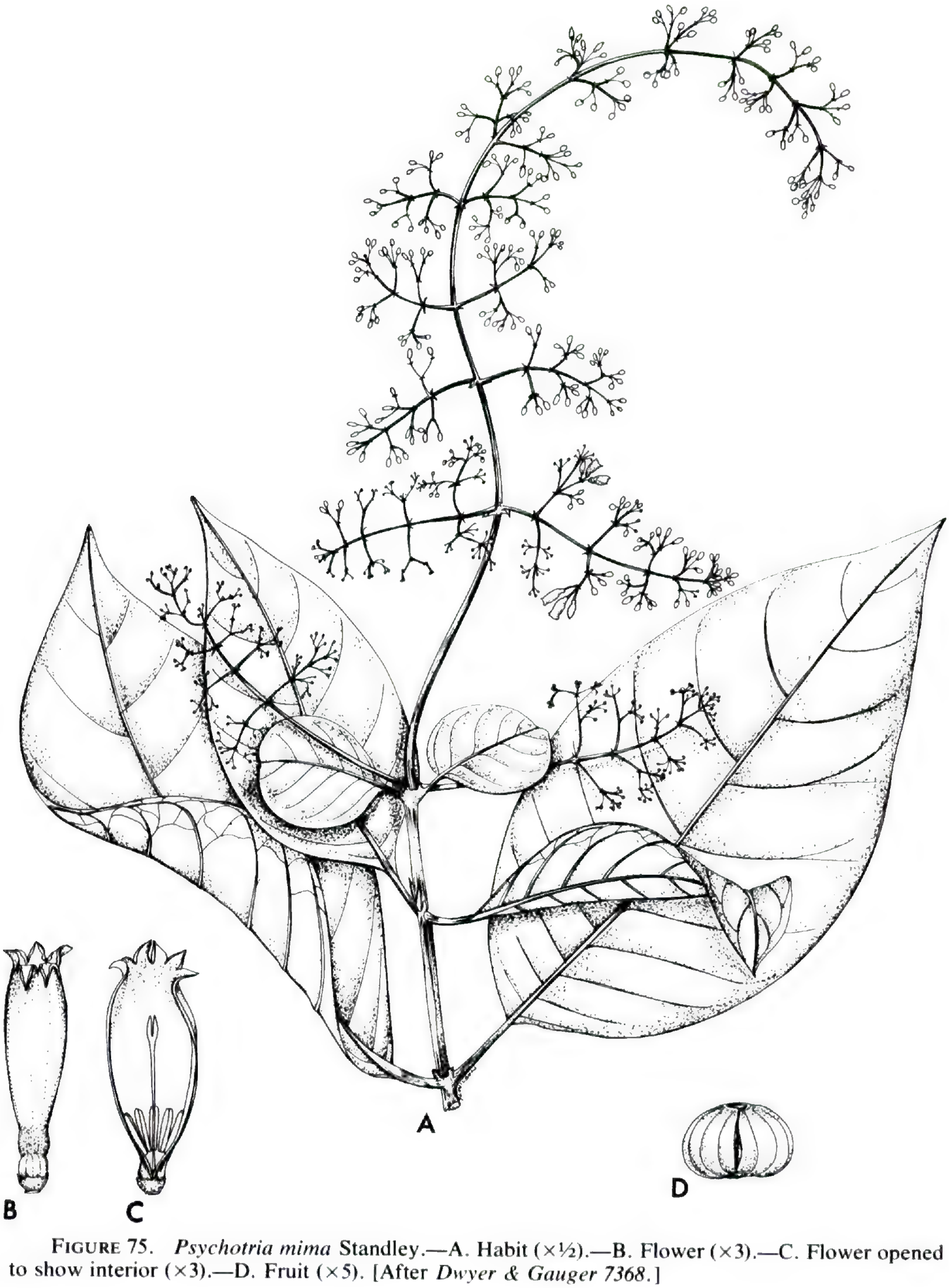

FIGURE 75. *Psychotria mima* Standley.—A. Habit (×½).—B. Flower (×3).—C. Flower opened to show interior (×3).—D. Fruit (×5). [After *Dwyer & Gauger 7368*.]

mm long, to 5 mm wide, glabrous, the pyrenes with the ventral face (endocarp) plane, the dorsal face with a single rib.

Psychotria microdon ranges from Mexico south to Ecuador. Its range includes the Guianas and the West Indies.

CANAL ZONE: Madden Dam, *Dwyer & Lallathin 8809* (MO); *Ebinger 868* (MO); *Hayden 72* (MO). Salamanca Hydrographic Station, Rio Pequeni, *Woodson et al. 1565* (F, MO). CHIRIQUÍ: 2 mi SW of Puerto Armuelles, *Croat 22456* (MO). COCLÉ: 1–5 mi S of Anton, *Tyson & Blum 2561* (MO). DARIÉN: Río Tuquesa below Quebrada Venado, *Bristan 1069* (MO). Río Pirre, *Croat & Porter 15523* (MO). El Real to Pinogana, *Duke 4899* (MO). Río Tuquesa, *Mori 7006* (MO). Middle Tuquesa Mining Co. Camp called Charco Peje, *Mori 7103* (MO). Yaviza, Río Chucunaque, *Stern et al. 92* (MO). El Real, Río Tuira, *Stern et al. 799* (MO). LOS SANTOS: 1–2 mi W of Candelaria, *Duke 12436* (MO). Pedasí, Río Purio, *Dwyer 2504* (MO). PANAMÁ: Trapiche, *Allen 2623* (F). Panama City, *Bartlett & Lasser 16332* (MO). Nueva Gorgona Beach, *Duke 4531* (MO). Isla Tabogilla, *Duke 5881* (MO). Taboga Island, *Dwyer 2181 A* (MO); *Gentry 5718* (MO). Tabogilla Island, across from N shore of Punta Chame, *Mori & Kallunki 5764* (MO). Taboga Island, *Pittier 3528, 3531* (both MO). Chepo, *Pittier 4561* (MO). Matias Hernandez, *Pittier 6713* (MO). Old Panama, *Riley 149* (MO, US). Bella Vista, *Standley 25349* (US). Taboga Island, *Standley 27067* (US). Matías Hernández, *Standley 31993* (MO). Saboga Island, *Tyson 5584* (MO). Pacheca Island, *Tyson 5608* (MO). 1 mi E of El Llano, *Tyson 6831* (MO). Taboga Island, *Woodson et al. 1471* (F, MO).

56. **Psychotria mima** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 204. 1940. TYPE: Brazil, *L. B. Smith 1878* (F, holotype).—FIG. 75.

Trees to 5 m tall, the branchlets slender, terete, glabrate to puberulent. *Leaves* oblong to ovate oblong, 6.0–19.5 cm long, 2.0–8.5 cm wide, deltoid to obtuse at the apex, acuminate, the acumen to 1.7 cm long, widely cuneate to subobtuse at the base, occasionally inequilateral, the costa immersed or somewhat prominulous above, prominulous beneath, smooth, the lateral veins ca. 10, the middle veins to 2 cm apart, arcuate ascending, often with parallel intermediate evanescent veins, thinly coriaceous, usually drying gray or tan gray, glabrate but often rufous puberulent on the costa or on the lateral veins; petioles to 2.5 cm long, to 0.18 cm wide; stipules briefly or almost completely connate, cylindrical, to 0.8 cm long, each part 2-lobed at the apex, the lobes obtuse, each shorter than the sheath, stiffly scarious, glabrous or glabrescent. *Inflorescences* terminal, pyramidal paniculate, to 45 cm long, the peduncles absent or elongate, to 0.2 cm wide at the base, sinuous, glabrous, the branches opposite, spreading or reflexed, well spaced, the lowermost to 10.5 cm long, the secondary branches floriferous, paired, opposite, well spaced, at right angles to the secondary branches, the bracts subulate, to 0.5 cm long, reflexed, persistent, the cymules few flowered, spreading. *Flowers* with the hypanthium rotund, to 1.3 mm long, puberulent, the calycine cup ca. 0.3 mm long, glabrous and with minute appressed rotund glands within, the calycine teeth 5, subequal, deltoid, to 0.3 mm long, acute, puberulent marginally and without; corolla white or cream maroon, the tube linear cylindrical, to 12 mm long, ca. 2 mm wide, glabrous outside and in except villosulose at the anther attachment position, the lobes 5, narrow oblong, cucullate, glabrous, petaloid; stamens 5, the anthers oblong, ca. 1.7 mm long, occasionally minutely apiculate, dorsifixed, the filaments short, attached near the base of the tube; stigmas 2, linear, to 2 mm long, the style compressed, 4–7 mm long. *Fruits* (fragmentary) subrotund, to 3 mm in diam., smooth, black, lightly ribbed.

Psychotria mima occurs in Panama, Colombia and Brazil. The inflorescence in the living plant is blue or purple. One Colombian collection (*Forero 797* [MO]) has excellent fruits which are compressed rotund. The inflorescence is epedunculate or one may consider the tip of the twiglet as bearing 3 discrete peduncles, the median to 12.5 cm long.

BOCAS DEL TORO: Between Buena Vista coffee finca and Cerro Pilón cloud forest, *Kirkbride & Duke 678* (MO). COLÓN: Santa Rita Ridge, 19 km from paved highway, *Dwyer 8574* (MO). DARIÉN: Demartaganala, Camp Summit, *Duke 15827* (MO). Camp Summit near Darien-San Blas border, *Oliver et al. 3694* (COL, MO, UC). PANAMÁ: Cerro Jefe, *Duke 9401* (MO); *Dwyer & Gauger 7368* (MO); *Dwyer & Gentry 9469* (MO). Gorgas Mem. Lab., 5–10 km NE of Altos de Pacora, *Mori & Kallunki 3423* (MO). Cerro Jefe, *Tyson et al. 3246* (MO). VERAGUAS: 5 mi W of Santa Fe, Escuela Agricola Alto Piedra, 800–1200 m, *Croat 23077* (MO). 5 mi NW of Santa Fe, 700–1200 m, *Croat 23156* (MO). Valley of Río Dos Bocas, 15.6 km NW of Santa Fe, *Croat 27787* (MO). NW of Santa Fe, 1.5 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5309* (MO). COLOMBIA: CHOCO: Region of Rio Pichma, Waunana, 100 m, *Forero 797* (MO).

57. **Psychotria morii** Dwyer.[104] TYPE: Panama, *Mori 3139* (MO, holotype).

Shrub to 1.25 m tall, the stems smooth, glabrous, perhaps succulent, the pith porate, the nodes well spaced. *Leaves* large, elliptic oblong, to 31 cm long, to 14 cm wide, acuminate, the acumen triangular, to 1 cm long, ultimately acute, widely deltoid or subobtuse, basally attenuate acute or slightly inequilateral, the costa prominulous and grooved above, prominulous beneath, the lateral veins ca. 15, arcuate, prominulous on both sides, the marginal vein absent, the intervenal areas spreading reticulate, membranous, discolorous, dark green above when dry, the hairs curled, subulate, often with the basal cell red; petioles 8–11 cm long, to 0.25 cm wide, the hairs dense, webby; stipules connate, swollen and collar shaped, to 0.6 cm long, truncate, scarious, glabrescent, the hairs few. *Inflorescences* axillary, to 8 cm long, to 3 cm wide, the peduncle to 4 cm long, the branches 3, often radiate, these to 1.5 cm long, the cymes congested; bracts to 1 cm long, concave, the margins scarious, sparsely ciliolate, except the margins strongly ciliolate. *Flowers* with the hypanthium somewhat turbinate, 1.2 mm long, glabrous, the calycine cup 0.5 mm long, petaloid, densely ciliate outside, glabrous within, the cystoliths dense, the teeth 5, triangular, 0.5 mm long, acute with a thin veil located between the teeth, the hairs of the sheath many, erect; corolla white ca. 2.5 mm long, carnose, ciliate outside, glabrous within, the lobes 5, somewhat longer than the tube, cucullate; stamens 5, the anthers oblong, 1.8 mm long, obtuse at the apex, sagittate at the base, the filaments short, attached below the middle; ovarian disc barrel shaped, 0.3 mm long, the style 0.7 mm long, the stigmas 2, linear oblong, scarcely wider than the style. *Fruits* rotund, ca. 6 mm in diam., red, the fleshy part, when dry, punctate, glabrous, the pyrenes glabrous, not costate.

Psychotria morii is known only from Panama. It is named in honor of Dr. Scott Mori, distinguished collector of tropical American plants and authority on

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[104] *Psychotria morii* Dwyer, spec. nov. *Folia* magna elliptico-oblonga, ad 31 cm longa, ad 14 cm lata, apice lato-deltoidea vel subobtuse, acuminata, basi attenuato-acuta venis lateralibus ca. 15, membranacea ciliis crispis subulatis; petiolis 8–11 cm longis; stipulis connatis turgido-colliformibus, ad 0.6 cm longis. *Inflorescentiae* axillares, ad 8 cm longae, ad 3 cm latae; pedunculo ad 4 cm longo, ramis 3 plerumque radiatis terminato eis ad 1.5 cm longis, cymis congestis; bracteis ad 1 cm longis. *Flores* cupula calycis ca. 0.5 mm longa, extus denso-ciliata intus glabra dentibus ca. 0.5 mm longis, vagina diaphana inter dentes locata ciliis vaginae multis erectis; corolla ca. 2.5 mm longis, lobis cucullatis; antheris ca. 1.8 mm longis. *Fructus* rotundi, ca. 0.6 cm diam., pyrenis laevibus non-costatis.

the Lecythidaceae. The new species is distinguished by its relatively large collar-shaped stipules and by the thin interdental veil of the calyx. The smoothness of the pyrenes is also noteworthy.

VERAGUAS: N of Santa Fe, 6.5 km from Agricultural School, *Mori 3139* (MO).

58. **Psychotria mortoniana** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 355. 1938. TYPE: Costa Rica, *Skutch 2697* (F, holotype; NY, isotype).

Shrubs to 6 m tall, the branchlets 4-angled, glabrescent or villosulose, the nodes well spaced. *Leaves* oblong or elliptic, 8.5–27.0 cm long, 3–11 cm wide, deltoid at the apex, acuminate, the acumen to 2.5 cm long, usually falcate, acute to attenuate acute at the base, the costa subplane above, prominent beneath, to 0.2 cm wide proximally, the lateral veins 22–25, arcuate, to 1 cm apart, stiffly chartaceous, often discolorous, darker green or brown above, yellow green beneath, villosulose above, especially on the costa and veins, subvelutinous beneath, the costa and veins barbate; petioles slender or stout, to 2 cm long, to 0.2 cm wide, densely villosulose; stipules free, oblong rotund, 6–12 mm long, with 2 proximate erect awns at the apex, to ½ the length of the body, the body appressed, scarious, velutinous. *Inflorescences* terminal, pyramidal paniculate, to 12.5 cm long, the peduncle ca. 4 cm long, the rachis with about 3 pairs of well spaced, opposite branches, the bracts spreading or deflexed, subulate, 0.7–1.5 cm long. *Flowers* sessile, the hypanthium short, the calycine cup short, eglandular within or with a minute erect gland at the junction of 2 lobes, the lobes 5, unequal, triangular to oblong, to 1 mm long, petaloid, carnose, venose, marginally pubescent; corolla white, the tube cylindrical, somewhat inflated, ca. 2.2 mm long, petaloid, glabrous, the lobes 5, erect, oblong, venose, somewhat cucullate, to 1.5 mm long, obtuse; stamens 5, the anthers included in the tube, oblong, ca. 1 mm long, the filaments short, attached just below the middle of the tube; style slender, 2.8–4.5 mm long, the stigmas 2, oblong, often plumose, 0.4–0.7 mm long. *Fruits* sessile, enclosed by 1 or 2 bracteoles, oblong, occasionally subrotund, ca. 3 mm long, white hirsute, obtusely ribbed.

Psychotria mortoniana is known from Costa Rica and Panama.

CHIRIQUÍ: W of Cerro Pando, ca. 6000 ft, *D'Arcy & D'Arcy 6663* (MO). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2218* (MO).

59. **Psychotria nervosa** Swartz, Prodr. 43. 1788. TYPE: Jamaica, *Swartz,* not seen.

P. rufescens H.B.K., Nov. Gen. Sp. Pl. 3: 364. 1818. LECTOTYPE: Venezuela, *Humboldt & Bonpland,* not seen.
P. hirta H.B.K., Nov. Gen. Sp. Pl. 3: 364. 1818. TYPE: Colombia, *Humboldt & Bonpland,* not seen.
P. lanceolata Nutt., Amer. Jour. Sci. Ser. 1, 290. 1822. TYPE: East Florida, no collector given.
P. oligotricha DC., Prodr. 4: 514. 1830. TYPE: Jamaica, Porto Rico, Martinique, no collectors given.
P. portoricensis DC., Prodr. 4: 515. 1830. TYPE: Porto Rico, *Bertero,* not seen.
Myrstiphyllum undatum (Jacq.) Hitchc., Ann. Rep. Missouri Bot. Gard. 4: 95. 1893.
Psychotria nervosa subsp. *rufescens* (H.B.K.) Steyermark, Mem. New York Bot. Gard. 23: 480. 1972.
Psychotria nervosa subsp. *rufescens* var. *hirta* (H.B.K. ex R. & S.) Steyermark, Mem. New York Bot. Gard. 23: 481. 1972.

Shrubs to 5 m tall, the branchlets terete, pubescent to glabrate, the nodes well spaced or occasionally crowded at the apex of the twiglets. *Leaves* lanceolate or oblanceolate, often narrowly so, occasionally falcate, 4–15 cm long, 1.8–7.0 cm wide, tapering acutely or obtusely into a distinct or indistinct acumen, the acumen to 2 cm long, ultimately acute or obtuse, basally acute, attenuate acute or cuneate, the costa plane or grooved above, subprominent beneath, the lateral veins 10–15, arcuate, occasionally strict but arcuate toward the margin, the submarginal undulate vein conspicuous, chartaceous, often drying reddish, ferrugineous villosulose or villose above and beneath, occasionally glabrate above, often with bases of deciduous hairs giving a punctate appearance; petioles either absent or to 1.5 cm long; stipules connate, at least at the very base, often becoming free from the node as a movable cylinder, each part oblong rotund, 0.8–1.5 cm long, obtuse, venose, pilose. *Inflorescences* terminal, occasionally pseudoterminal, solitary or ternately disposed, ferrugineous pubescent, umbelliform paniculate or conglomerate capitate, 1–5 cm long, to 7 cm wide, either epedunculate with several radiate branches or pedunculate, the peduncles 0.5–1.3 cm long, occasionally the peduncle with one cymule or a rachis with 2–3 pairs of opposite branches terminated by cymules. *Flowers* with the hypanthium ca. 0.5 mm long, the calycine cup saucer shaped and expanded, glabrous to puberulent outside, glabrous and eglandular within, to 0.5 mm long, the margin of the cup undulate or with triangular teeth, to 0.35 mm long; corolla white, the tube narrow at the base, somewhat campanulate above, glabrous to puberulent outside, villosulose near the filament attachment position within, the lobes 5, ovate oblong, almost equal to the tube, villosulose at base; stamens 5, the anthers oblong, to 0.5 mm long, the filaments slender, to 2 mm long, attached at the mouth; style slender, ca. 1 mm long, the stigmas upright, ca. 0.4 mm long. *Fruits* sessile, yellow orange to red, ovoid oblong to oblong, to 0.7 cm long, about 2 times longer than wide, conspicuously sulcate, glabrous to rufous pubescent, the remnants of the calyx scarcely measurable.

Psychotria nervosa occurs in subtropical Florida, the Bahamas, the West Indies, in Central America and northern South America.

CANAL ZONE: Las Cruces Trail, *Bartlett & Lasser 16444* (MO). Albrook, *Blum 1213* (MO). Cerro Viejo on K 16 C, *Blum 1221* (MO). C-15 Road, *Blum & Dwyer 2459* (MO). Fort Sherman, *Croat 12515* (MO). Fort Kobbe, *Duke 4728* (MO). Fort Sherman, *Duke & Mussell 6640* (MO). Madden Dam, *Dwyer 8394, 8813* (both MO). Fort Sherman, *Dwyer & Robyns 152* (MO). Albrook, *Dwyer 6638, 6706, 7315* (all MO); *Hayden 66* (MO). Las Cruces Trail, *Hunter & Allen 699* (MO). Río Petitpie, road to Fort Sherman from Gatún Locks, *Mori & Kallunki 2682* (MO). C-29 Road, *Nee 8993* (MO). Madden Dam, *Porter et al. 4052* (MO, SCZ, UC). Curundu, *Tyson 4176* (MO). Fort Sherman, *Tyson & Dwyer 1183, 1193* (both MO). Pipeline Road, *Witherspoon & Witherspoon 8397* (MO). Salamanca Hydrographic Station, *Woodson et al. 1588* (MO). BARRO COLORADO ISLAND: *Bailey & Bailey 63* (F). COCLÉ: Antón, *Dwyer 2898* (MO). Llano Bonito, *Seibert 520* (MO). Las Margaritas and El Valle, *Woodson et al. 1745* (F, MO). COLÓN: Garotte, *D'Arcy 4002* (MO). Isla Grande, *D'Arcy 4014* (MO). Río Guanche, ca. 3 km upriver from bridge, road to Portobelo, *Mori & Kallunki 5213* (MO). DARIÉN: Yaviza, Río Chucunaque, *Stern et al. 145* (MO). PANAMÁ: Río Pacora, *Bartlett & Lasser 16957* (MO). Calzada Larga, *Croat 12395* (MO). San José Island, *Duke 12540* (MO). Pedro Gonzales (Perlas Archipelago), *Dwyer 1725* (MO). Santa Clara, *Dwyer 4264* (MO). Cermeño, *Dwyer 6630* (MO). Cerro Azul, *Dwyer 7128* (MO). San Jose Island, *Johnston 142* (MO). SAN BLAS: Ailigandi, *Dwyer 6815* (MO).

60. **Psychotria nubiphila** Dwyer.[105] TYPE: Panama, *Croat 15990* (MO, holotype).

Trees to 4 m tall, the ultimate branchlets glabrous, the nodes well spaced, turgid with the bases of the persistent stipules. *Leaves* often inequilateral, elliptic, 10–15 cm long, 5–7 cm wide, deltoid toward the apex, basally acute to attenuate acute or cuneate, the costa prominulous above and beneath, the lateral veins 10–12, arcuate, the intervenal areas smooth, the ultimate venules evanescent, subpapyraceous, concolorous, glabrous above, puberulous on the costa and with the hairs crowded in the vein axils beneath; petioles to 3.5 cm long, to 0.25 mm wide, rigid but at times reflexed; stipules connate, the sheath cup shaped, to 1 mm long, glabrous except red glandular punctate, truncate, the margin erose. *Inflorescences* terminal, solitary, cymose paniculate, to 13 cm long, to 9 cm wide, the peduncle 1.5–3.5 cm long, 0.3 cm wide, twisted, glabrous, the lowermost branches opposite, strongly ascending, to 6 cm long, the upper branches 3–4-jugate, opposite, well spaced. *Flowers* with the hypanthium turbinate, 1 mm long, red when dry, the calycine cup short, turgid, to 0.5 mm long, the teeth irregular, ciliolate; corolla green, the tube cylindrical, 3.5 mm long, rigidly petaloid, glabrate outside, densely barbate near the mouth within, the lobes 5, reflexed, triangular, 3.5 mm long; stamens (4–)5, the anthers oblong, 1 mm long, obtuse, the filaments unequal; style 3 mm long, the stigmas short. *Fruits* not seen.

Psychotria nubiphila is known only from Panama.

CHIRIQUÍ: NW side of Cerro Pando, *Croat 15990* (MO).

61. **Psychotria oerstediana** Standley, Contr. U.S. Natl. Herb. 23: 1390. 1926. TYPE: not designated.

Mapouria obovata Oerst., Biol. Centr. Amer., Bot. 17. 1863. TYPE: not seen.
Psychotria quinqueradiata Polak., Linnaea 41: 570. 1877. TYPE: Costa Rica, *Polakowsky 94* (B, holotype; US, photo).
Psychotria morae Polak., Linnaea 41: 470. 1877. TYPE: Costa Rica, *Polakowsky 171*, not seen.
Psychotria obovata (Oerst.) Hemsley, Biol. Centr. Amer., Bot. 2: 50. 1881. Not *P. obovata* Ruiz & Pavón (1799). TYPE: not seen.

Shrubs 1.0–1.5 m tall, the branchlets smooth, glabrous, the nodes well spaced. *Leaves* elliptic, obovate elliptic or oblong rotund, 4.0–11.5 cm long, 1.8–6.0 cm wide, widely deltoid to rounded or obtuse at the apex, acuminate, the acumen vague or obvious, usually widely triangular, ultimately obtuse, basally cuneate, attenuate acuminate to acute, the costa prominulous above, prominent beneath, the lateral veins 8–12, at first strict, arcuate toward the margin, the submarginal vein near or far from the margin, occasionally with minute "domatia" in the axils

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[105] *Psychotria nubiphila* Dwyer, spec. nov. *Arbores* ad 4 m altae ramulis ultime glabris. *Folia* elliptica 10–15 cm longa, 5–7 cm lata, venis lateralibus 10–12, subpapyracea supra glabra in costa infra puberula ciliis in axillis confertis; petiolis ad 3.5 cm longis; stipulis connatis ad 1 mm longis, glabris praeter rubro-granuloso-punctatis truncatis marginibus erosulosis. *Inflorescentiae* terminales solitariae cymoso-paniculatae, ad 13 cm longae, ad 9 cm latae, pedunculo 1.5–3.5 cm longo. *Flores* cupula calycis ca. 0.5 mm longa, dentibus brevissimis irregularibus ciliolatis; corolla tubo ca. 3.5 mm longo; antheris ca. 1 mm longis.

of the lateral veins beneath, stiffly papyraceous, smooth, glabrous, drying gray red or gray; petioles 0.2–1.0 cm long (longer in extra Panama material); stipules deciduous, connate, the sheath ca. 2 mm long, each part with 2 lanceolate lobes longer than the sheath, glabrous. *Inflorescences* terminal, 1–3 cm long, usually 1 cm long, the flowers aggregated into subrotund heads, the peduncle absent or if present to 1.8 cm long, the flowers on scarcely measurable branches (in extra Panama material to 3.5 cm long and radially disposed); bracts and bracteoles deciduous. *Flowers* sessile, drying red or red black; hypanthium 0.5 mm long, glabrous, the calycine cup cupuliform, shorter than the hypanthium, truncate, the teeth scarcely evident, presumably 5, glabrous; corolla white, the tube cylindrical, to 4 mm long, to 1 mm wide, glabrate outside, villose at and above the filament attachment position within, petaloid, the lobes 5, short or to 2 mm long (extra Panama material), glabrate; anthers oblong, 1.0–1.3 mm long, the filaments to 2.3 mm long, attached near the middle of the tube; ovarian disc black, usually longer than the calycine cup, the style to 2.3 mm long, the stigmas narrowly oblong, to 1.3 mm long. *Fruits* subsessile, oblong, to 6 mm long, to 4 mm wide, obtusely ribbed, glabrous, drying black.

Psychotria oerestediana ranges from Mexico to Panama. Unfortunately I have seen only 4 collections from Panama.

BOCAS DEL TORO: Milla 7½, railroad 10 km NW of Almirante, *Nee & Hansen 14085* (MO). CANAL ZONE: Chagres, *Fendler 59* (MO). COCLÉ: El Valle, N rim, *Allen & Alston 1853* (MO). Forest behind Club Campestre, El Valle, *Duke 13246* (MO).

62. **Psychotria officinalis** (Aubl.) Raeuschel ex Sandw., Kew Bull. 1931; 473. 1931.

Nonatelia officinalis Aubl., Hist. Pl. Guiane 1: 182. 1775. TYPE: Cayenne, French Guiana, *Aublet*, not seen.
Psychotria involucrata Willd. Sp. Pl. 1. 966. 1798. Not Swartz 1788.

Shrubs or *trees* to 4.5 m tall, glabrous, the nodes well spaced. *Leaves* elliptic, oblong elliptic or ovate elliptic, 4–22 cm long, 1.5–11.0 cm wide, deltoid, acute or occasionally tapering somewhat obtusely at the apex, acuminate, the acumen to 3 cm long, acute, cuneate or obtuse at the base, the lateral veins 6–11, arcuate, the submarginal vein close to the margin, stiffly membranous to papyraceous, 4–22 cm long, 1.5–11.0 cm wide, concolorous, usually drying green, often lustrous above, glabrous above and usually so beneath; petioles 0.5–2.2 cm long, stiff, glabrous; stipules small, free, subrotund to cup shaped, 0.5–5.0 mm long, the 2 awns shorter than or to 4 times longer than the body, glabrate. *Inflorescences* terminal, occasionally in the uppermost axils, usually glabrous, usually purple, occasionally puberulent, often subrotund or oblong, paniculate, to 7.5 cm long, to 4.5 cm wide; peduncle 1.3–3.2(–5.0) cm long, the lowermost branches often 3–5, radiate and giving an umbellate appearance, the branches few, usually opposite; bracts of the floral branchlets 1–3, usually blue or purple, the largest bract subulate, involute, 0.4–1.3 cm long, to 1 mm wide. *Flowers* sessile, soon going to fruit, the calyx and hypanthium 1.5 mm long, puberulent, the calycine cup short, with 5 ovate or subrotund lobes, 0.2–0.3 mm long, often wider than long,

with a gland at each interdental position; corolla white, the tube and lobes 5 mm long, the tube ca. 1.0 mm long, partly glabrous and partly pilulose outside, hairy within, the lobes ovate, ca. 2 mm long, glabrous within except basally; stamens 5, the anthers 0.8–1.2 mm long, the filaments to 2.5 mm long; ovarian disc lobed, the style to 4 mm long. *Fruits* obovoid or subrotund, to 3.5 mm wide, glabrous or occasionally with a few hairs, costate.

Psychotria officinalis occurs in Middle America and northern South America.

BOCAS DEL TORO: Between Quebrada Huron and Puerto Palenque, *Kirkbride & Duke 504* (MO). Duwebdulup Peak, N of Río Terebé, *Kirkbride & Duke 580* (MO). Between Quebrada Menaco and Buena Vista on Chiriquí Trail, *Kirkbride & Duke 665* (MO). Chiriquí Lagoon, *Wedel 1422* (MO). Water Valley, *Wedel 1608* (MO). Fish Creek, *Wedel 2196 A* (MO). CANAL ZONE: Hill C-6, Fort Sherman, *Duke 4413* (MO). 1 mi N of Summit Garden, *Tyson & Blum 1494* (MO). Fort Sherman, *Tyson & Blum 1653* (MO). COCLÉ: La Mesa, *Croat 13328* (MO). Cerro Pilón, ca. 3000 ft, *Duke & Lallathin 15001* (MO). La Mesa, *Dwyer 8311* (MO). Cerro Pilón, *Dwyer 8346* (MO). La Mesa, 8.5 mi from Club Campestre, El Valle, *Dwyer 10520* (MO). El Valle, La Mesa, *Dwyer 11907* (MO). Cerro Gaital and Caracoral, *Dwyer & Correa 8895, 8904* (both MO). Cerro Pilón, *Dwyer & Lallathin 8606, 8620* (both MO). El Cope, El Potroso, *Folsom & Lantz 1882* (MO). Alto de Calvario, 7 km N of El Cope, *Folsom & Robinson 2348* (MO). La Mesa, N of El Valle, ca. 1000 m, *Gentry 6852* (MO). La Mesa, *Kennedy et al. 2084* (MO). 4 km N of El Valle, *Nee & Dwyer 9216* (MO). La Mesa, *Nee & Hale 9619* (MO). Cerro Pilón, above El Valle, *Porter et al. 4397, 4415, 4474* (all MO). DARIÉN: Between Río Balsa and Río Areti, *Duke 8748* (MO). Cativo swamp near Tusijuanda, *Duke 13523* (MO). Puerto St. Dorothea, *Dwyer 2223, 2251* (both MO). Cana-Cuasi Trail between Cerro Campamiento and La Escalera, *Kirkbride & Duke 1338* (MO). Cerro Pirre, 300–700 m, *Mori & Kallunki 5396* (MO). PANAMÁ: Cerro Jefe, road to Altos de Pacora, *Croat 22650* (MO). Panama Viejo, *Duke 5728* (MO). 2 mi upstream from Río Sancanti, near Piria, *Duke 14377* (MO). Cerro Jefe, to 3100 ft, *Dwyer 9431* (MO). 9.4 km N of Goofy Lake, *Folsom et al. 1983* (MO). Cerro Jefe, *Gentry 3497* (MO); *Gentry et al. 3428, 3429, 3461* (all MO). Cerro Campana, *Lewis et al. 1907* (GH, MO, UC, US). Chimán, *Lewis et al. 3261* (MO). 6.5 km by road N of Cerro Azul, *Nee 9306* (MO). Road past Cerro Azul, *Mori & Kallunki 2189* (MO). Cerro Azul, *Tyson 2139* (MO). Cerro Jefe, *Tyson et al. 3320* (MO); *Wilbur et al. 11339* (MO). SAN BLAS: 3–4 hr by foot up Río Mulutupu, *Kirkbride 218* (MO). VERAGUAS: 5 mi W of Santa Fé, road past Escuela Agricola Alto Piedra, 800–1200 m, *Croat 23013* (MO). Road between Escuela Agricola and Alto Piedra and Río Dos Bocas, *Croat 25946* (MO). Valley of Río Dos Bocas, between Alto Piedra and Calovebora, *Croat 27457* (MO). Valley of Río Dos Bocas, 15.6 km NW of Santa Fé, *Croat 27638, 27640* (both MO). Cerro Tuté, *Dwyer s.n.* (MO). 6–7 km W of Santa Fé, 2900 ft, *Nee 9712* (MO). COLOMBIA: CHOCO: Curiche and Alto Curiche, *Duke 9604* (MO).

63. **Psychotria olgae** Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 42. 1968. TYPE: Panama, *Dwyer et al. 8193* (MO, holotype).

Trees or *shrubs* to 8 m tall, the branchlets terete, ultimately subplane, smooth, glabrous, usually the nodes turgid, well spaced below the tips, crowded terminally. *Leaves* strongly ascending, obovate elliptic, oblong rotund, subrotund or elliptic, 4.5–11.0 cm long, 1.5–5.0 cm wide, rounded, obtuse to deltoid at the apex, cuneate at the base, the costa prominulous above, prominulous to prominent beneath proximally, the lateral veins 5–8, arcuate, 0.8–1.5 cm apart, evanescent above, prominulous beneath, thickly coriaceous, lustrous, glabrous, occasionally drying yellow, the margins conspicuously revolute; petioles absent or to 1.5 cm long, lignose, glabrous; stipules often persistent, ?free, broadly cup shaped 0.2–1.5 cm long, much wider than long, usually with 2 mammiform bulges at each side, coriaceous, glabrous, fimbriate ciliate within. *Inflorescences* terminal, glabrous, to 11 cm long, to 5 cm wide, cymose paniculate, the peduncle

to 4.5 cm long, stiff, the branches disposed as 4–5 pairs, the cymules few flowered, terminal; bracts and bracteoles ovate subulate, ca. 2.5 mm long. *Flowers* sessile or short pedicellate; hypanthium 1.3 mm long, the calycine cup short with 1–2 minute glands at the junction of the lobes, the lobes 5, triangular, ca. 0.5 mm long, the calyx spread at anthesis; corolla white, to 5 mm long, the tube short, somewhat expanded basally, puberulent or glabrous outside, densely barbate within above the middle, the lobes 5, narrowly oblong, 2–4 mm long, cucullate; stamens 5, the anthers narrowly oblong, 2.5–3.0 mm long, the filaments short, 1 mm long; style thickly cylindrical to linear, 4–11 mm long, the stigmas small. *Fruits* obovate oblong, 1–2 cm long, 1 cm wide, obtuse at the apex, acute basally, carnose, red, 10–12-ribbed.

Psychotria olgae is endemic to Panama. Its thick coriaceous leaves and large fruit distinguish it from all other *Psychotria* of Middle America.

PANAMÁ: Cerro Jefe, *Dwyer 7288* (MO). Cerro Jefe and La Eneida, *Dwyer et al. 8193* (MO). Cerro Jefe, on top near antenna, *Folsom & Harp 1368* (MO). Cerro Jefe, ca. 1000 m, *Mori 7133* (MO).

64. **Psychotria orchidearum** Standley, J. Wash. Acad. Sci. 18: 276. 1928. TYPE: Costa Rica, *Standley & Valerio 50863* (US, holotype).

64a. **Psychotria orchidearum** Standley ssp. **orchidearum.**

Epiphytic *subshrub*, to 30 cm, the branchlets terete, smooth, glabrous, the nodes well spaced, occasionally swollen. *Leaves* oblong, obovate oblong, oblong rotund to elliptic, 1.8–8.0 cm long, 0.8–3.5(–4.5) cm wide, often inequilateral, tapering obtusely, deltoid or acute at the apex, usually conspicuously shortly acuminate, acute to obtuse occasionally rounded at the base, often inequilateral, the costa subplane above, prominulous beneath, the lateral veins 4–6(–7), evanescent or obvious, strongly arcuate, the intervenal areas indistinct, succulent, drying thinly to thickly coriaceous, concolorous or discolorous, smooth or wrinkled on drying, glabrous; petioles to 1 cm long, slender to stout, 0.15–0.32 cm wide, glabrous; stipules annular, cylindrical, 3–4 mm long, usually slightly wider than long, stiffly scarious, smooth, glabrous. *Inflorescences* bright red, terminal or occasionally axillary, glabrous, to 6 cm long, occasionally slightly wider than long, paniculate when the branches are paired and arising along the rachis or subcorymbiform when the branches arise verticillately from the apex of the peduncle, the peduncles to 2.5 cm long, to 1.2 mm wide, the branches strongly ascending or reflexed, to 2 cm long, branching dichotomously or terminating in several verticillate branches, the flowers few. *Flowers* subsessile or with pedicels to 2.5 mm long; hypanthium red, pubescent and minutely granulose, the calycine cup short or absent, usually with 4 triangular teeth, to 0.4 mm long, acute; corolla white or magenta, the tube narrowly cylindrical, to 3 mm long, glabrous outside, villose within at the point of filament attachment, the lobes 4, oblong, ca. 0.35 mm long, obtuse; stamens 4, the anthers oblong, rotund, ca. 0.6 mm long, the filaments short; stigmas 4, the styles linear, the ovary 4-celled, the ovules 1 per

locule, attached basally. *Fruits* orange red, fleshy, subrotund to obovate-rotund, ca. 3–4 mm in diameter, truncate, glabrous, usually appearing 8-sulcate (4 pyrenes) on drying.

Psychotria orchidearum is known from Costa Rica and Panama. The use of the specific name *orchidearum* is a stop-gap measure, as the taxonomy of the epiphytic *Psychotria* is in disarray. The 4-carpellate nature of the pistil is noteworthy.

CANAL ZONE: Between Fort San Lorenzo and Fort Sherman near Pavon Road junction with Road 82 (S 2), *Mori & Kallunki 2722* (MO). PANAMÁ: 10 km N of El Llano on Carti Road, ca. 400 m, *Busey 919* (MO). Cerro Jefe, ca. 950 m, *Elias & Hayden 1804* (GH, MO). 16 km above Panamerican Highway, El Llano to Carti Tupile, *Kennedy et al. 2431* (MO). La Eneida, *Luteyn & Foster 1123* (MO). Cerro Jefe, ca. 950 m, *Tyson et al. 3199, 3400, 4381* (all MO); *Witherspoon et al. 8274* (MO).

64b. **Psychotria orchidearum** subsp. **persedens** Dwyer.[106] TYPE: Panama, *Tyson 5331* (MO, holotype).

Similar to *Psychotria orchidearum* subsp. *orchidearum* except the leaves tend to be less than 2½ times longer than wide, more distinctly acuminate at the apex, and if drying yellow, not strongly wrinkled.

There is some overlapping between material identified as subsp. *orchidearum* and the new subsp. The leaves of subsp. *persedens* are much more variable in shape: oblong, obovate oblong, oblong rotund to subrotund. In general, they do not have the ligulate or straplike appearance of subsp. *orchidearum*. The leaf blades may dry as to appear smooth: *Folsom 4476, 4235*; *Duke & Elias 13757*. The leaves may be very wide: *Gentry et al. 3497* and *Witherspoon et al. 8274*. In *Maas & Dressler 727* the leaves are subrotund. Whether the veins are conspicuous or inconspicuous in dried leaves of subsp. *persedens* seems of little importance. The subspecific name "persedens" refers to the epiphytic habit of the plant, meaning "residing over a long period of time."

In stained sections of the leaf, fixed in the field in Formalin, Acetic Acid and Alcohol (FAA) and embedded in paraffin after treatment in tertiary butyl alcohol, I noted a distinct band of cells located near the center of the mesophyll. This was not observed in sections of several non-epiphytic species of Panamanian *Psychotria*.

CHIRIQUÍ: San Felix, 800–1200 m, *Croat 33429* (MO). Cerro Horqueta, *Hagen & Hagen 2093* (MO). Cerro Pando, ca. 2000 m, *Mori & Bolten 7321* (MO). COCLÉ: Cerro Pajita, N of El Valle, *Allen & Allen 4181* (MO). El Valle, Road from Interamerican Highway, *Correa 332* (MO). La Mesa, ca. 800 m, *Croat 25393, 37446* (both MO). Top of El Petroso, 800 m, *D'Arcy 11350* (MO). Cerro Pilon, *Duke 12148* (MO). El Valle, *Duke 13186* (MO). Elfin Forest, Cerro Caracoral, ca. 1000 m, *Duke & Dwyer 15082* (MO). La Mesa, *Dwyer 8261, 10539* (both MO). Cerro Gaital Caracoral, *Dwyer & Correa*

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[106] *Psychotria orchidearum* subsp. *persedens* Dwyer, subsp. nov. Differt a *P. orchidearum* subsp. *orchidearum* foliis saepe lato-oblongis oblongo-rotundis ad subrotundis vulgo apice conspicue breviacuminatis in sicco saepe tenui-coriaceis et laevibus; laminis foliorum si in sicco luteis et valde rugosis minus quam 2½-plo longioribus quam latioribus.

8874 (MO). Cerro Pilon, *Dwyer & Lallathin 8969* (MO). El Valle to La Mesa, *Dwyer & Nee 11928* (MO). 7 mi N of El Cope, *Folsom 3217, 4144* (both MO). Summit, Alto Clavario, 900 m, *Folsom & Robinson 2414* (MO). Cerro Gaital Caracoral, *Kirkbride 1108 A* (MO). El Valle, *Nee & Hale 9637* (MO); *Wilbur et al. 11117* (MO). DARIÉN: Cerro Pirre, *Bristan 544, 589* (both MO). Gold Mining Camp, Headwaters of Rio Tuquesa, *Croat 27259* (MO). Cerro Pirre, *Croat 37893* (MO); *Duke 6118* (MO); *Duke & Elias 13757* (COL, MO, UC), *13833* (MO); *Folsom 4235* (MO). Summit of Cerro Pirre, *Gentry & Clewell 7155* (MO). Top of Cerro Mali, *Gentry & Mori 13647, 13691* (both MO). W peak of Cerro Tacarcuna massif, 1800–1850 m, *Gentry & Mori 13994* (MO). Cerro Tacarcuna, 1720 m, *Gentry et al. 16899* (MO). Cana Trail between Cerro Campamiento and La Escalera, *Kirkbride & Duke 1296* (MO). PANAMÁ: Cerro Campana, *Allen 1879* (MO). 10 mi N of El Llano, *Busey 360 A* (MO). Cerro Campana, *Croat 14782, 17196* (both MO). Cerro Jefe, ca. 2900 ft, *Dwyer et al. 3497, 7277* (both MO). Cerro Campana, *Gentry 4945, 5777* (both MO). El Llano, *Gentry 5801* (MO). Cerro Campana, *Kennedy et al. 2072, 2085* (both MO); *Maas & Dressler 727* (MO); *Mori & Kallunki 2467, 2484, 3580, 3603* (all MO). El Llano, *Nee & Dressler 9347* (MO). Cerro Campana, *Porter et al. 4210* (MO, SCZ, UC), *4960* (MO, UC, VEN). Cerro Jefe, ca. 2900 ft, *Porter et al. 5073* (MO). Cerro Campana, *Tyson 5331* (MO). Cerro Jefe, *Tyson et al. 3292, 3426, 4346* (all MO). SAN BLAS: 2–5 mi S of Mandinga Airport, *Duke 14790* (MO). VERAGUAS: Cerro Tute above Santa Fe, *Gentry 6271* (MO). 5 mi W of Santa Fe, *Liesner 967* (MO). Cerro Tute, NW of Santa Fe, 2 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5276* (MO).

65. **Psychotria oresbia** Dwyer.[107] TYPE: Panama, *Gentry & Mori 14150* (MO, holotype).

Trees to 6 m, the twiglets slender, smooth, glabrous, the nodes well spaced, swollen. *Leaves* oblong, 3–9 cm long, 2–4 cm wide, rounded or obtuse at the apex, acuminate, the acumen to 1 cm long, obtuse or rounded at the base, the costa slender, prominulous above and beneath, the lateral veins 8–10, slender, widely arcuate, the undulate submarginal vein well set in from the margin, the margin delicately callose, the intervenal area reticulate, smooth, stiffly chartaceous, discolorous, glabrous; petioles slender, stiff, 0.8–1.0 cm long, scarcely alate; stipules tending to persist at the end of the twiglets, connate, cup shaped, the sheath to 2 mm long, toothless, coriaceous, with 2 triangular lobes shorter than the sheath, glabrous, sometimes with minute crustlike excrescences. *Inflorescences* terminal, racemose in appearance, to 4 cm long, to 3 cm wide, the peduncle 5 mm long, the rachis stiff, the 5 pairs of opposite branches arranged distichously, the uppermost about equal to the lowermost, to 1.5 cm long, divergent, strict, glabrous but with minute excrescences, each branch with 1–2 3-flowered cymules; bracts at the base of branches ovate, 2.2 mm long, acute, somewhat clasping, spreading or somewhat ciliolate. *Flowers* sessile or subsessile, hypanthium 1 mm long, glabrous, drying black, the calycine cup expanded, 0.5 mm long, the margin undulate, the teeth scarcely measurable or widely oblong triangular, to 0.8 mm long, acute, carnose, glabrous; corolla cream colored, the tube (almost mature) subcampanulate, ca. 2 mm long, somewhat constricted above the base, ca. 0.8 mm wide at the base, glabrous outside, villosulose only at the base within, the lobes 5, narrowly oblong, about as long as the tube, obtuse and somewhat constricted terminally with an obtuse beaklike projection, to 0.5

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[107] *Psychotria oresbia* Dwyer, spec. nov. *Arbores* ad 6 m altae. *Folia* oblonga, 3–9 cm longa, 2–4 cm lata, versum apicem rotundata venis lateralibus 9–10, rigido-chartacea; petiolis ad 1 cm longis; stipulis terminaliter persistentibus connatis vagina ad 2 mm longis, coriacea lobis triangularibus brevibus praedita. *Inflorescentiae* terminales in aspectu racemosae ad 4 cm longae.

mm long, located adaxially and perpendicular to the axis of the lobe, located ca. 0.4 mm below the apex of the lobe; stamens 5, the anthers narrowly oblong, ca. 2.2 mm long, obtuse, the filaments slender, ca. 1 mm long, attached near the middle of the tube; ovarian disc rotund, ca. 0.5 mm long, the style 1.5–2.0 mm long, the stigmas 2, ca. 1 mm long. *Fruits* not seen.

Psychotria oresbia is known only from Panama but is to be expected in adjacent Colombia. It is distinguished by its oval-oblong leaves, its inflorescence with several pairs of branches distichously arranged and scarcely varying in length. The corolla lobes are striking, having thumblike projections located below the tips and extending in perpendicular fashion from the lobe. The petiole of one leaf has an oblong bladelike dilation distally measuring 1 cm long, ca. 0.5 cm wide. This resembles the wing of the leaf of *Citrus*. The leaf in question may be anomalous.

DARIÉN: Cerro Tacarcuna W of ridge, trail toward Río Pucuro, just below summit camp, lower montane wet forest, 1500–1600 m, *Gentry & Mori 14150* (MO).

66. **Psychotria ostaurea** Dwyer & Hayden, Ann. Missouri Bot. Garden 54: 143. 1967. TYPE: Panama, *Wedel 1461* (MO, holotype).

Trees to 8 m tall, the branchlets glabrous, the bark cracking, the pith often porate. *Leaves* elliptic rotund to ovate oblong, 15–28 cm long, 7.5–15.0 cm wide, deltoid at the apex, distinctly acuminate, basally obtuse to widely cuneate, the costa subprominent above and beneath, somewhat rubescent when dry, the lateral veins 9–14, arcuate, glabrous above, finely puberulent on the costa and the veins beneath, the intervenal areas spreading reticulate, rigidly papyraceous, concolorous, shiny above; petioles to 3.5 cm long, glabrous, stiff; stipules free, persistent at the ends of the twiglets, oblong rotund or ovate oblong, 0.2–0.9 cm long, obtuse or rounded at the apex, scarcely retuse or with 2 obtuse lobes, to 1 mm long, stiff, glabrous, drying dark. *Inflorescences* terminal, spreading, cymose paniculate, to 12 cm long, to 8 cm wide, the peduncles 2.0–4.5 cm long, minutely puberulent, terminated by 4 branches, arcuate and umbelliform ascending or paniculate, the branches to 6 cm long, spreading, the flowers few; bracts and bracteoles deciduous. *Flowers* sessile or on pedicels to 2 mm long; hypanthium 1 mm long, glabrous, the calycine cup saucer shaped, 1 mm long, undulate and truncate, the teeth absent, pale yellow when dry; corolla white, the tube cylindrical, to 1.3 cm long, scarcely turgid at the base, glabrous or minutely puberulent outside, villose basally within, the lobes 5–6, thick, to 5 mm long, obtuse; stamens 5, the anthers exserted or not, narrowly elliptic, 4–5 mm long, the filaments to 2 mm long, attached near the mouth; style to 8 mm long, the stigmas subulate or digitiform, to 2.5 mm long, sessile. *Fruits* sessile, oblong rotund, to 1 cm in diam., glabrous.

Psychotria ostaurea is known only from Panama.

BOCAS DEL TORO: Trail above Quebrada Menaco, in transition cloud forest, Chiriqui Trail, *Kirkbride & Duke 661* (MO). Water Valley, *Wedel 1461* (MO). COCLÉ: Base of Cerro Pilón, ca. 2000 ft, *Gentry 3669* (MO).

67. **Psychotria panamensis** Standley, Contr. U.S. Natl. Herb. 18: 132. 1916. TYPE: Panama, *Pittier 3194* (US, holotype).

Trees to 14 m tall, the branchlets smooth, drying gray, glabrous, the nodes well spaced. *Leaves* lanceolate or ovate lanceolate, rarely oblong rotund, occasionally narrow, 5–20 cm long, 1–9 cm wide, tapering acutely or obtusely toward the apex, occasionally with a cusp to 2 cm long, acute, cuneate or occasionally obtuse at the base, often slightly inequilateral, the lateral veins 7–15(–18), widely arcuate, the costa prominulous above, prominent and often angular beneath, occasionally with domatia in the axils of the lateral veins beneath, chartaceous to subcoriaceous, usually drying deep brown or chocolate brown above, reddish brown beneath, glabrate above and beneath; petioles 1.0–4.5 cm long, slender to somewhat stout, glabrous; stipules connate basally, ovate oblong, to 1 cm long, to 0.65 cm wide at the base, obtuse, appressed, stiff, ciliolate. *Inflorescences* terminal, occasionally axillary, often not solitary but 2 or 3 together, cymose paniculate, to 12 cm long to 10 cm wide, puberulent or glabrate; peduncles to 6 cm long, 0.1–0.2 cm wide, often stiff, lignose, 4-angled, the branches often stiff, lignose, 4-angled, opposite or occasionally ternate, the lowermost branches to 6.5 cm long, the upper branches disposed in 4–5 sets; bracts and bracteoles ovate subulate, to 1 mm long, ferrugineous villose especially adaxially, the pedicels bearing an apical bracteole ca. 0.5 mm long. *Flowers* (immature) usually sessile or subsessile; calycine cup to 1 mm long, glabrous, eglandular within, the teeth 5, irregular, subtriangular, to 0.5 mm long; corolla white or yellow green, to 4 mm long, thickly petaloid, glabrous outside, densely villose near the mouth, the lobes 5, oblong, 1.2–2.2 mm long, slightly cucullate, villose at the base; stamens 5, the anthers oblong, ca. 1.1 mm long, obtuse, the filaments short, attached near the mouth; stigmas 2, unequal, narrowly oblong, ca. 1 mm long, the style ca. 3.2 mm long. *Fruits* on pedicels shorter than the fruit; oblong to subrotund, to 1.2 cm long, drying dark, often rusty red, glabrous, fleshy, the 2 pyrenes often giving the persistent fleshy surface a ribbed effect or flesh deciduous, pyrenes glabrous, ribbed.

Psychotria panamensis is known only from Panama. The leaves are usually large but occasional specimens have reduced leaves, e.g., *White 248* (F, MO).

CANAL ZONE: Miraflores Lake, *White 248* (F, MO). CHIRIQUÍ: Bambito to Cerro Punta, *Allen 308* (F, MO). Río Chiriquí Valley, *Allen 1387* (F, MO). Boquete, *Davidson 363* (F, MO). Puerto Armuelles, *Davidson 1120* (F). Boquete, *Dwyer & Hayden 7963* (COL, DUKE, K, MO, NY, UC, VEN). Las Siguas Camp, Cerro Horqueta, *Pittier 3194* (US). Río Chiriquí Viejo, *White 10, 69, 159* (all F, MO), *187* (F). COCLÉ: El Valle, *Duke 13151* (MO). COLÓN: Santa Rita Ridge Road, *Dwyer & Correa 8423* (MO). DARIÉN: Caná-Cuasi Trail (Camp 2), Chepigana, *Terry & Terry 1436* (F, MO). PANAMÁ: 9.4 km N of Goofy Lake, 900 m, *Folsom et al. 1968* (MO). El Llano-Carti Road, 16–18½ km by road N of Panamerican Highway, 400–450 m, *Nee & Tyson 10939* (MO). VERAGUAS: Road from Santa Fe, past Agricultural School to base of Cerro Tute, 1000–1200 m, *Folsom 1603* (MO).

68. **Psychotria parvifolia** Benth. ex Oerst., Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1852: 36. 1853. TYPE: Costa Rica, *Oersted 11637* (F, photo of type).

Shrubs to 2 m tall, densely branched, the branches slender, the branchlets slender, puberulent or shortly pilose. *Leaves* ovate or oblong, 1.0–3.5 cm long,

to 1.5 cm wide, acute or obtuse, tapering at the base, the blade decurrent, membranous, glabrous, drying black, usually with axillary domatia; petioles short, slender; stipules deciduous, ovate, ca. 4 mm long, ferrugineous. *Inflorescences* terminal, sessile, cymose paniculate, the cymes few flowered, the bracts deciduous. *Flowers* usually sessile; calyx truncate; vaguely dentate; corolla white, 3–4 mm long, glabrous outside, villous within, the lobes 4. *Fruits* small, rotund, red.

Psychotria parvifolia is found in Guatemala, Costa Rica, and Panama.

CHIRIQUÍ: Boquete, *Maxon 4958* (US).

69. **Psychotria perparva** Dwyer.[108] TYPE: Panama, *Gentry et al. 16921* (MO, holotype).

Herbs to 0.5 m tall, perhaps unbranched, the stem succulent?, strongly compressed on drying, smooth, glabrous, the nodes well spaced. *Leaves* large, oblong, to 30 cm long, to 20 cm wide, obtuse or widely triangular at the apex, acumen absent, basally cuneate, attenuate acute or rounded at the base, occasionally inequilateral, the costa ventrally convex, prominulous, prominent and convex beneath, to 3.5 mm wide below, the lateral veins 25–30, widely arcuate, joining to form a scarcely undulate submarginal vein to 3 mm from the margin, occasionally a pair arising from the costa as a unit but immediately diverging, the base of each lateral vein dilated, the intervenal areas patulous reticulate, scarcely visible above, invisible beneath, chartaceous, succulent, discolorous, minutely farinose punctate, especially below; petioles to 2.5 cm long, to 0.4 cm wide; stipules deciduous (one seen) connate?, 2–4 mm long, to 12 mm wide, ringlike or hemispherical, truncate or rounded, coriaceous, glabrous, with a small bulge or pair of bulges in a median or subterminal position, 2–3 mm long. *Inflorescences* axillary, the peduncles to 16 cm long, to 0.25 cm wide, sinuous, sparsely puberulent, the rachis slender, to 4 cm long, the branches disposed as 2 pairs, opposite, well spaced, the lowermost to 2 cm long, each branch in turn with a pair of reduced branchlets at or above its middle, these terminated by a much reduced glomerule or 3 compressed glomerules, each to 0.7 cm wide; bracts and bracteoles tending to persist, similar, the lowermost bracts persistent, triangular subulate, to 12 mm long, often as long as the flowerless portion of the primary branches, closely appressed to the latter; bracts subtending the glomerules several, involucrate, the outermost oblong triangular, to 6 mm long, to 3 mm wide, thinly carnose, venose, puberulent (perhaps only marginally). *Flowers* sessile, few per glomerule; hypanthium oblong, apparently shorter than the calycine teeth in juvenile state,

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[108] *Psychotria perparva* Dwyer, spec. nov. *Herbae* to 0.5 m altae glabrae nodis bene distantibus. *Folia* oblonga, ad 30 cm longa, ad 20 cm lata, acumine nullo venis lateralibus 25–30 areis inter venas subtus vix visibilibus, chartacea minuto-farinosa; petiolis ad 2.5 cm longis, ad 0.4 cm latis; stipulis connatis?, 2–4 mm longis. *Inflorescentiae* axillares, pedunculo ad 16 cm longo, rhachi ad 4 cm longa ramis 2-jugatis oppositis bene distantibus inferioribus ad 2 cm longis, ramo utroque jugo ramulorum reductorum praedito, ramulis 3 glomerulis terminalibus florum praeditis. *Flores* dentibus calycis 5, 1.2–1.7(–2.0) mm longis; corolla ad 2.2 mm longa; antheris ca. 1 mm longis. *Fructus* sessiles ad 0.65 cm longi, apice rotundi, glabri.

glabrous?, truncate at the apex, rounded at the base, the calycine teeth 5, oblong triangular, 1.2–1.7(–2.0) mm long, fleshy, apparently glabrous; corolla white, to 2.2 mm long in the mature bud, carnose, puberulent outside, within villose near the base of the anthers, the latter oblong, ca. 1 mm long, sessile?; style ca. 0.8 mm long, the stigmas 2, upright, ca. 0.35 mm long, scarcely wider than the style; ovarian disc prominent, compressed oblong, ca. 0.5 mm long, truncate. *Fruits* (one seen) sessile, to 0.65 cm long, rounded at the apex, the calycine lobes persistent, glabrous, the raphides abundant.

Psychotria perparva is known only from Panama. It is named "perparva" because of its diminutive size. It has very large leaves for its height and the lateral veins are very numerous. The bulges on the surface of the stipules are diagnostic, although only one stipule was observed. The small glomerules of flowers associated with the structurally complex inflorescence are noteworthy.

PANAMÁ: Cerro Tacarcuna Massif between summit camp on westernmost ridge and Pico Tacarcuna, mostly elfin forest, 1650–1800 m, *Gentry et al. 16921* (MO).

70. **Psychotria philacra** Dwyer.[109] TYPE: Panama, *Gentry & Mori 13916* (MO, holotype).

Shrubs to 3 m tall, the branchlets terete, slender, smooth, glabrous, the nodes well spaced. *Leaves* persisting at the tips of the twigs, ascending, elliptic, often slightly falcate, 4.0–6.5 cm long, 1.5–3.0 cm wide, acute or subobtuse at the apex, acuminate, the acumen triangular, to 1 cm long, ultimately obtuse, basally acute or attenuate acute, the costa prominulous, the lateral veins ca. 7, arcuate, prominulous, the submarginal vein inconspicuous, chartaceous, concolorous, glabrous, minutely granulose beneath; petioles slender, to 1 cm long, to 0.6 cm wide; stipules deciduous. *Inflorescences* (in fruit) umbelliform, to 5 cm long, to 3 cm wide, the peduncle slender, to 3 cm long, ca. 0.5 mm wide, glabrous, terminated by 3 radially disposed branches, these to 1.8 cm long. *Flowers* deciduous, few, 5–8 on each branch, the pairs of flowers ca. 0.4 cm apart. *Fruits* subsessile, compressed-rotund, to 1 cm in diam., glabrous, obtusely 12-costate, the persistent disc of the ovary umbonate.

DARIÉN: Cerro Tacarcuna, 1250–1450 m, *Gentry & Mori 13916* (MO).

71. **Psychotria pilosa** Ruiz & Pavón, Fl. Peruv. Chil. Prodr. 2: 60. 1799. TYPE: Peru, *Ruiz* (B, isotype labeled "*Psychotria pilosa* in Peruviae nemoribus," not seen; photo, MO).

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[109] *Psychotria philacra* Dwyer, spec. nov. *Frutices* ad 3 m alti, ramulis glabris. *Folia* elliptica, 4,0–6.5 cm longa, 1.5–3.0 cm lata, conspicue acuminata venis lateralibus ca. 7, chartacea glabra; petiolis ad 1 cm longis. *Inflorescentiae* umbelliformes, glabrae ad 5 cm longae, ad 3 cm latae, pedunculo gracili, ad 3 cm longo, ca. 0.5 mm lato, ramis 3 radiate dispositis terminato, eis ad 1.8 cm longis, floribus (hic deciduis) 5–8 in utroque ramo, jugis florum ad 0.4 cm distantibus. *Fructus* subsessiles compresso-rotundi, ad 1 cm diam., glabri obtuse 12-costati disco ovarii umbonato.

Shrubs to 3 m tall, the branchlets terete, hirsute, the nodes occasionally proximate, usually well spaced, 2.0–5.5 cm apart. *Leaves* oblong, occasionally oblong rotund, 10–40 cm long, 4.5–17.0 cm wide, rounded or deltoid at the apex, the acumen to 1.5 cm long or longer, often falcate, the base obtuse, acute or widely cuneate, occasionally subrotund, the costa slender, prominulous above, prominent beneath, the lateral veins 15–20, widely arcuate, prominent beneath with 1–2 subparallel veins between adjacent lateral veins, the minor veins pinnatiform, the intervenal areas patulous reticulate, stiffly chartaceous, concolorous, pilose above and beneath; petioles to 2.5 cm long, densely pubescent; stipules connate, the sheath to 2 cm long, each part oblong rectangular or ovate oblong with 2 widely subulate lobes, to 0.7 cm long, ca. 0.3 cm wide at the base, often somewhat divergent, widely scarious margined, villose outside. *Inflorescences* terminal, solitary, often nodding, cymose paniculate or disposed as a capitate mass of flowers, 6–12 cm long, 2.5–6.0 cm wide; peduncle elongate, 5.0–6.5 cm long, ca. 0.25 cm wide, villose, the lowermost branches 3–4, radiate, 0.5–2.0 cm long; bracts oblong or ovate lanceolate, 4.8–7.0 mm long, usually acute or deltoid at the apex, thickly petaloid, villose inside and out. *Flowers* sessile; hypanthium oblong, densely bearded, the calycine cup scarcely measurable, eglandular within, the lobes (4–)5(–6), unequal, triangular or subulate, 1–2 mm long, densely hirsute; corolla white, to 1.5 mm long, villosulose within at filament attachment, the lobes 5, oblong, 0.5 mm long, cucullate; stamens 5, the anthers oblong, 0.65 mm long, the filaments 0.5 mm long; style 1 mm long, the stigmas minute. *Fruits* with the pyrenes oblong, to 4 mm long, obtuse at the apex, costate, densely bearded, the hairs soft, white, usually more dense at each pole, dark blue or china blue.

Psychotria pilosa is known from Costa Rica, Panama, and from northern South America to Peru. Among the Panamanian *Psychotria* it is readily distinguished by its large scarious-margined stipules, its many-veined leaves which are hairy beneath, and its densely pilose inflorescence.

Most collections note that it is 2–3 m tall. *Croat 25777* records a height of 5.5 m. The single collection from San Blas, *Liesner 1311,* has leaves twice the size of the other collections from the Republic. The fruits are described on several collections as blue, china blue, dark blue purple, and black. The clusters of fruits are described by *Mori et al. 3819* as "grapelike." *Mori & Kallunki 3152* note that the tree is "slender, few and laxly branched."

BOCAS DEL TORO: Without other locality, *Wedel 174* (MO). Nievecita, *Woodson et al. 1831* (MO). CHIRIQUÍ: 1 mi E of Cañas Gordas, near Costa Rica border, *Croat 22325* (MO). COCLÉ: Cerro Pilón, *Dwyer 8309, 8349* (both MO); *Dwyer & Lallathin 8605, 8964* (both MO); *Dwyer et al. 4485* (MO). El Valle, La Mesa, *Kennedy et al. 3029* (MO). Cerro Pilón, *Lallathin 2-C, 2D, 30-C* (all MO). La Mesa, 4 km N of El Valle, 850 m, *Nee & Dwyer 9192* (MO). DARIÉN: Cerro Pirre, *Bristan 469* (MO); *Duke 5346* (MO); *Duke & Elias 13783* (GH, MO, US). PANAMÁ: Cartí Tupile road, 12 mi above Panamerican Highway, 200–500 m, *Liesner 1199* (MO). Gorgas Memorial Lab, 5–10 km NE of Altos de Pacora, *Mori & Kallunki 3418* (MO). SAN BLAS: Road from El Llano to Carti-Tupile, 300–500 m, *Liesner 1311* (MO). VERAGUAS: Valley Río Dos Bocas, 11–13 km beyond Agricultural School, Santa Fé, 350–500 m, *Croat 25777* (MO). Valley of Rio Tercero Braso beyond Escuela Agricola Alto Piedra, Santa Fé, *Croat 27340* (MO). 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3152, 3180* (both MO); *Mori et al. 3819* (MO).

72. **Psychotria pithecobia** Standley, Publ. Field Columbian Mus., Bot. Ser. 8: 187. 1930. TYPE: Costa Rica, *Tonduz 12432* (F, holotype).

Epiphytic *subshrubs*, to ¾ m tall, the stems angular, smooth, glabrous, the nodes well spaced, 2–8 cm apart. *Leaves* elliptic to oblong, often ovate elliptic to obovate elliptic, 5.0–9.5 cm long, 1.2–4.5 cm wide, usually less than 2½ times longer than wide, acute, obtuse or somewhat rounded at the apex, acuminate, the acumen to 1 cm long, usually finally acute, the costa prominulous above and below, slender, usually drying yellow, the lateral veins 10–13, arcuate, prominulous, conspicuous on drying, not forming an undulate submarginal vein, the veins between the laterals few, these either arising from the costa or arising solely from the laterals themselves, coriaceous on drying, concolorous, drying a dirty yellow or brown, glabrous; petioles 0.5–1.0 cm long, slender or crassate; stipules connate, compressed cylindrical, 2–4 mm long, truncate and scarious above. *Inflorescences* terminal, occasionally both terminal and axillary, cymose paniculate, 6–10 cm long, 2.5–9.5 cm wide, usually patulous, the peduncle 2.0–4.5 cm long, slender, stiff, with about 3 pairs of opposite primary branches, the terminal primary branches few and alternate, the secondary branches usually disposed as 1 obvious opposite pair, the terminal secondary branches much reduced and very few, the cymes usually 2–5, each with 2–6 flowers; bracts and bracteoles narrowly oblong, to 3.5 mm long, acute. *Flowers* pedicellate, the pedicels 1–5 mm long; hypanthium ca. 1 mm long, glabrous, the calyx cup ca. 0.5 mm long, glabrous, the teeth 4, with perhaps 2 (or more?) very reduced accessory ones, triangular, to 0.5 mm long; corolla white, often tinged with pink, the tube in bud cylindrical, ca. 4 mm long, glabrous outside, villosulose within near filament attachment, the lobes short; stamens 5, the anthers oblong, to 0.8 mm long, obtuse, the filaments very short, attached near the middle of the tube; style about as long as the corolla tube, linear, the stigmas 4, very slender, ca. 0.7 mm long. *Fruits* subrotund, 3.5–5.0 mm wide, red to orange red, turning black, glabrous, the calyx deciduous.

Psychotria pithecobia is known only from Costa Rica and Panama. It is distinguished from *P. orchidearum* Standley by having more lateral veins in the leaves and the flowers on more elongate pedicels.

CHIRIQUÍ-BOCAS DEL TORO BORDER: Cerro Colorado, 11.2 km along ridge road from main road to Escopeta, 1700 m, *Folsom 4880* (MO). CHIRIQUÍ: Bajo Chorro, Boquete, 6000 ft, *Davidson 218* (MO). Top of Cerro Colorado, 1500 m, *Folsom & Collins 1786* (MO). Bajo Mono, *Folsom et al. 2254* (MO). Bajo Mono and Quebrada Chiquero, 1500 m, *Woodson & Schery 571* (MO).

73. **Psychotria pittieri** Standley, Contr. U.S. Natl. Herb. 18: 132. 1916. TYPE: Panama, *Pittier 2266* (US, holotype).

P. dispersa Standley, J. Wash. Acad. Sci. 18: 184. 1928. TYPE: Costa Rica, *Standley & Valerio 45548* (US, holotype).

Key to subspecies

a. Inflorescence with conspicuous white indumentum; leaves usually whitish beneath ..... 73a. *P. pittieri* subsp. *pittieri*

aa. Inflorescence without conspicuous white indumentum; leaves purplish beneath ..... 73b. *P. pittieri* subsp. *oinochrophylla*

73a. **Psychotria pittieri** Standley subsp. **pittieri.**

Shrubs 1.0–1.5(–2.5) m tall, much branched above, the branches ascending, terete, smooth, slender, glabrous, the twiglets puberulent, the nodes well spaced. *Leaves* oblong or lanceolate, 5–15 cm long, 2.0–3.5 cm wide, tapering cuneately at the apex, often cuspidate, the cusp to 1.2 cm long, often falcate basally cuneate, acute to obtuse, often vaguely inequilateral, the costa prominulous above, prominent beneath, often with smaller parallel veins evanescing toward the margin, papyraceous, regularly drying dark green above, gray green beneath, glabrate above except on the costa, white pubescent beneath, especially on the costa and veins, or only minutely puberulent on the veins beneath; petioles to 1 cm long, slender, villosulose; stipules with at least the bases persistent, connate, to 6 mm long, each part with 2 awns, the awns subulate, longer than the sheath, the sheath pilose and appressed setose within, the setae conspicuous. *Inflorescences* terminal, paniculate, usually shorter than the terminal leaves, ovoid or oblong, the peduncles often nodding, slender, 1.0–4.5 cm long, the primary branches whorled, 3–4 per whorl, to 1 cm long, perpendicular to arcuate ascending, villose, the bracts linear subulate, to 6 mm long, the bracteoles shorter, usually irregularly 3-lobed, the secondary branches short, bearing a few flowers. *Flowers* sessile; hypanthium shorter than the calycine teeth, the teeth 5, subulate, 0.5–0.8 mm long, acute, puberulent, the calycine cup with 5 patches of minute oblong glands at the base within, these ca. 0.1 mm long; corolla white to yellow, 4–6 mm long, puberulent outside, the tube pubescent at the mouth within, the lobes 5, short, thinly carnose; stamens 5, the anthers oblong, ca. 0.9 mm long, included or exserted, the filaments almost lacking or elongate; style puberulent, the stigmas 0.5–1.0 mm long. *Fruits* subrotund, 3.5–6.0 mm wide, violet or turning to blue, the pyrenes ovoid, ca. 3 mm long, puberulent, 5-costate, concave in cross section.

Psychotria pittieri Standley ranges from Belize to Panama. The white or gray indumentum of the inflorescence and often of the leaf undersides of subsp. *pittieri* permits ready identification.

BOCAS DEL TORO: Nievecita, *Bartlett 3* (MO). Almirante, *Blum 1380* (MO). Railroad stop, milla 7.5, *Croat & Porter 16269* (MO). Río Teribé between Quebrada Huron and Quebrada Schlunjik, *Kirkbride & Duke 479* (MO). Chiriquicito to 5 m S along Río Guarumo, *Lewis et al. 2095* (MO), *2112* (COL, DUKE, K, MO, UC). Without locality, *Wedel 217, 360* (both MO). Nievecita, *Woodson et al. 1838* (MO). CANAL ZONE: Fort Sherman, U.S.A. Tropic Test Site, *Dwyer & Robyns 134* (MO). Pipeline Road, Río Agua Salud, *Kennedy 1855* (MO). Pipeline Road, *Mori & Kallunki 1722* (MO). Pipeline Road 9.2 km from Gamboa, *Mori & Kallunki 6487* (MO). Pipeline Road 19 km NW of Gamboa, *Nee & Smith 11106* (MO). Gorgona and Gatún, *Pittier 2266* (US). Pipeline Road, *Witherspoon & Witherspoon 8627* (MO). BARRO COLORADO ISLAND: *Croat 4107, 6469, 8732, 9547, 10100, 10797, 11243, 11599, 12205, 14581, 15104A, 15170, 15255* (all MO); *Ebinger 56* (MO); *Hayden 6, 9, 146, 156, 1028* (all MO); *Kennedy 1847* (MO). CHIRIQUÍ: Cerro Pando, NW side, *Croat 15898* (MO). Boquete, *Davidson 781* (MO). Upper Río Gariche, *Seibert 359* (MO). COCLÉ: El Valle, *Allen 214* (MO). El Valle, Cerro Pilón, *Dwyer & Correa 7957* (COL, DUKE, K, MO, UC). Volcan to Rio Serano, 16 km from Rio Serano, *Folsom 4049* (MO). Cerro Pilón, *Lallathin 11-1* (MO). Boca Del Toabré, *Lewis et al. 5520, 5543* (both MO, SCZ, UC, VEN). COLÓN: Portobelo, *Croat & Porter 15609* (MO). Tumba Vieja, *Dodge et al. 16932* (MO). Colón to Portobelo, 24.6 km E of Transisthmian Highway, *Folsom 3743* (MO). W of Portobelo, *Gentry 1753, 5141* (both MO). 10 mi SW of Portobelo, *Liesner 1069* (MO). Río Guanche, cutover woods along trail, *Mori & Kallunki 3021* (MO). Río Guanche, 2.5 km upriver from bridge, road to Portobelo, *Mori & Kallunki 3713* (MO); *Mori et al. 6467* (MO). DARIÉN: Ascent of Cerro Pirre, *Duke 5336* (MO). Cocalito, *Dwyer 5138* (MO). LOS SANTOS: 25 mi SW of Tonosí, *Lewis et al. 2904* (COL, MO, UC, VEN). PANAMÁ: Cerro Campana, *Croat 17217* (MO). Cerro Azul, *Dwyer 5133* (MO). Goofy Lake, *Dwyer et al. 4130A* (MO, SCZ).

Cerro Jefe, *Dwyer & Hayden 8095* (MO, UC); *Gentry et al. 3362* (MO). Base of Serrania de Maje, Mountain at Ipeti, *Folsom & Lantz 1921* (MO). Cerro Campana, *Kirkbride & Hayden 294* (MO). Altos del Río Pacora, *Lewis et al. 2315A* (MO). 5 mi SW of Cerro Brewster, *Lewis et al. 3393* (COL, DUKE, MO, UC, VEN). El Llano-Cartí Road, 8–11 km from Interamerican Highway, *Mori 7734* (MO). Junction of Río Pacora and Río Corso, *Oliver 2382* (GH, MO, US). Cerro Azul, *Porter et al. 4112* (MO, SCZ, UC). SAN BLAS: Puerto Obaldía, *Croat 16764* (MO). Above Puerto Obaldía, *Gentry 1486* (MO). Flood Plains and hills along Río Armula, ca. 10 m WSW of Puerto Obaldía, *Mori 6820* (MO).

73b. **Psychotria pittieri** subsp. **oinochrophylla** Dwyer.[110] TYPE: Panama, *Duke & Elias 13668* (MO).

Shrubs with the leaves purple beneath. *Inflorescences* moderately puberulent.

Psychotria pittieri subsp. *oinochrophylla* is known only from Panama. Among the Panamanian Rubiaceae the purplish undersurface of the leaf blades is rare. Occasionally *P. marginata* Ruiz & Pavón shows this character as does *P. santarosae* Standley.

DARIÉN: Cerro Pirre, cloud forest and/or mossy forest, 2500–4000 ft, *Duke & Elias 13668* (MO).

74. **Psychotria polyphlebia** Donnell Smith, Bot. Gaz. 33: 253. 1902. SYNTYPES: Guatemala, *Donn. Sm. 6854* (US); Costa Rica, *Tonduz 9577* (US).

Subshrubs, stoloniferous, the stems unbranched, terete, often sinuous, smooth, glabrous, the pith partially hollow. *Leaves* oblong, obovate oblong, to 14 cm long, to 7.5 cm wide, obtuse or widely deltoid at the apex, occasionally vaguely acuminate, cuneate at the base, often inequilateral, the costa prominulous above, prominent beneath, ca. 1.1 mm wide, the secondary veins to 25, widely arcuate, salient above, prominulous to prominent beneath, joining near the margin, papyraceous, sparsely or densely appressed hirsute beneath, occasionally diffuse granulose above with the bases of deciduous hairs, often with white raphides; petioles slender, to 6 cm long, ca. 0.15 cm wide, often curved, puberulent; stipules ?connate, disposed as a bowl-like band between the petioles, 1–2 mm long, the central acumen blunt, shorter than or longer than the body, glabrous. *Inflorescences* terminal or subterminal, the peduncles 0.5–3.5 cm long, ca. 0.1 cm wide, pubescent, the flowers numerous in a subrotund head to 1.5 cm wide, the bracts oblong, narrowly oblong or subulate, the larger bracts to 5(–8) mm long, ciliate and concave. *Flowers* sessile; hypanthium short, ca. 1 mm long, the calycine cup not measurable, the margin undulate or ?denticulate; corolla white or yellow, the tube narrowly cylindrical, to 4.5 mm long, delicately petaloid, pilose outside, densely villose at filament attachment position within, the lobes 5, narrowly oblong, shorter than the tube, vaguely cucullate; stamens 5, the anthers ca. 0.6 mm long, obtuse, the filaments slender, ca. 2.5 mm long, attached just below the mouth; ovarian disc compressed rotund, ca. 0.3 mm long, the style filamentous, ca. 2.5 mm long, the stigmas slender digitiform, ca. 0.5 mm long. *Fruits* sessile, subrotund, 6–8 mm in diam., glabrous, red, the strongly compressed pyrenes with the ventral face subconcave, the dorsal face 3-costate.

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[110] *Psychotria pittieri* subsp. *oinochrophylla* Dwyer, spec. nov. *Frutices* foliis subtus oinochrophyllis. *Inflorescentiae* modice puberulae.

Psychotria polyphlebia is known only from Costa Rica, Panama, and Colombia.

BOCAS DEL TORO: Between Quebrada Lagoon and Cerro Bonyik, 90–270 m, *Kirkbride & Duke 641* (MO). DARIÉN: Cerro Pirre, *Bristan 575* (MO). Cuasi-Caná Trail, Cerro Campamiento, *Kirkbride & Duke 1243* (MO). VERAGUAS: Guabal, 16 km NW of Santa Fé, 500 m, *Dressler 4781* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori et al. 4004* (MO). Second branch of Río Santa Maria, road from Santa Fé, *Witherspoon & Dressler 8896* (MO). COLOMBIA: CHOCO: Between Curiche and Alto Curiche, *Duke 9615* (MO). Rain forest N of Alto Curiche, 300 m, *Duke & Idrobo 11220* (MO, NY). Novita, N of Cerro Torra, road to Alto del Oso, 600–900 m, *Forero et al. 3099* (MO).

75. **Psychotria psychotriaefolia** (Seem.) Standley, Contr. U.S. Natl. Herb. 18: 133. 1916.

Cephaelis psychotriaefolia Seem., Bot. Voy. Herald 138. 1852. TYPE: Panama, *Seemann 482* (BM, not seen; photo, MO).

Shrubs or small trees, the branchlets terete, smooth, glabrous to ferrugineous tomentose, the nodes well spaced. *Leaves* lanceolate or obovate oblong, 4–18 cm long, 2.0–8.5 cm wide, usually acute, occasionally deltoid, often drawn into a triangular apical point, basally attenuate acute, rarely subobtuse, the costa prominulous to plane, sometimes grooved above, prominent beneath, to 0.15 cm wide proximally, the secondary veins 12–20, arcuate, uniting to form a submarginal vein ca. 1 mm from the margin, prominulous above and beneath, the intervenal areas smooth, the veinlets evanescent, papyraceous to subcoriaceous, often gray or gray red above, often drying dull red beneath, glabrous above, glabrate or farinose puberulent beneath, especially on the veins; petioles absent or to 0.7 cm long, the lamina decurrent; stipules connate but at maturity often tearing and thus appearing free, closely appressed, thin, deciduous, each part to 2 cm long, the sheath cylindrical, subtruncate, the 2 awns long attenuate, shorter than the sheath, ciliate. *Inflorescences* axillary or terminal, the peduncles rarely absent, usually 3–5 per axil, spreading radially, to 2.5 cm long, often branched apically, the branches 2–3 times as long as the peduncle or shorter than the peduncle, rufous pubescent, angular, the flowers in conglomerate heads, to 1.5 cm wide. *Flowers* with the hypanthium short, the calycine cup much shorter than the calycine lobes, the latter narrowly oblong, to 1.5 mm long, acute or obtuse, glabrous inside and out; corolla white, the tube short, 1.2–2.0 mm long, petaloid, glabrous outside, villose within at filament attachment, the lobes 5, oblong, cucullate, slightly shorter than or as long as the tube; stamens 5, the anthers oblong rotund, ca. 0.5 mm long, the filaments ca. 0.8 mm long; stigmas 3, subulate, the style slender, the ovarian disc oblong, ca. 0.7 mm long. *Fruits* ovoid to oblong, ca. 7 mm long, usually 2 times longer than broad, drying red, the mesocarp thick, fleshy, sweet, the 2 pyrenes oblong elliptic, the ventral side flattened, the dorsal side with 10 grooves, glabrescent, the raphides numerous, the calycine cup persistent but withered.

Psychotria psychotriaefolia extends from Costa Rica to northern South America, being reported from Colombia, Venezuela, and Ecuador.

PANAMÁ: BOCAS DEL TORO: Almirante, *G. P. Cooper 557* (F). Changuinola Valley, *Dunlap 229 B* (F, US). Susurba, Río Changuinola, *Dwyer 4399* (US). Río Teribe between Quebrada Treglo and Puerto Palenque, *Kirkbride & Duke 525* (MO). Changuinola to 5 mi S at junction of Río Changuinola and Río Teribe, *Lewis et al. 963* (GH, K, MO, NY, UC, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2103* (GH, MO, UC, US, VEN). Without other locality, *Wedel 364* (F, MO). CANAL ZONE: Without other locality, *Duke 6130* (MO). Fort Sherman, *Duke 9244* (MO); *Dwyer 8590* (MO). Madden Dam, Boy Scout Road, *Dwyer & Hayden 7* (MO). Frijoles, *Ebinger 90* (MO, US). Chagres, *Fendler 58* (MO, US). Fort Sherman, *Hayden 104* (MO). Mindi Hills, *Johnston 1636* (MO). Pipeline Road, *Kennedy & Wilder 3103* (MO). 3 mi E of Coco Solo Hospital, *Lazor & Blum 5396* (MO). Río Masambi Grande 80–100 m, *Nee 9419* (MO). Río Tapia, *Standley 38129* (US). Río Pedro Miguel, *Standley 29941* (US). France Field, *Standley 30370* (US). Fort Sherman, *Standley 31071* (US). 6 mi N of Gamboa, *Tyson 1496* (MO). Madden Lake, Boy Scout Camp, *Tyson 5447* (MO). Fort Sherman, *Tyson & Blum 1677* (MO); *Tyson & Dwyer 1184* (MO). Pipeline Road, *Witherspoon & Witherspoon 8301* (MO). BARRO COLORADO ISLAND: *Croat 12883* (MO). CHIRIQUÍ: Boquete, *Davidson 709* (F, US), *849* (F). COCLÉ: El Valle, *Allen & Alston 1853* (F, US). Cerro Gaital Caracoral, *Dwyer & Lallathin 8950* (MO). COLÓN: 4 m SW of Portobelo, *Croat 14114* (MO). Río Guanche ca. 2.5 km upriver from bridge, road to Portobelo, *Crosby & Denslow 6475* (MO). Río Guanche, 1–4 km upstream from Portobelo, *Gentry 8813* (MO). 2–3 mi up Río Guanche, *Kennedy & Foster 2135* (MO). Río Guanche, 2.5 km from bridge, road to Portobelo, *Mori et al. 6475* (MO). Río Guanche, 6 km S of Portobelo, *Nee & Gentry 8725* (MO). DARIÉN: Río Tuqueza below Quebrada Venado, *Bristan 1037* (MO). Río Aruza, *Bristan 1368* (MO). Cativo Camp, ca. 6 mi NW of El Real, *Duke 4824* (F, MO). Río Tucuti, ca. 2 hrs by piragua above Tucuti, *Duke 5263* (MO). 10 mi S of El Real on Río Pirre, *Duke 5412* (MO). Río Sambu, 0–5 mi above Río Venado, *Duke 9273* (MO). Río Pucro to Quebrada Maskia, *Duke 13081* (MO). Río Morti, Drill Site 7, *Duke 14185* (F, MO). Río Pirre near town of Pirre, *Gentry & Clewell 6938* (MO). Manene to mouth of Río Cuasi, *Kirkbride & Bristan 1449* (MO). Upper Rio Tuquesa, *Le Clezio 52* (MO). Río Tuquesa, Lower Tuquesa Mining Camp, *Mori 6933* (MO). PANAMÁ: Río Chagres, *Duke 4474* (MO). Goofy Lake, *Dwyer & Hayden 8042* (COL, DUKE, MO, UC, VEN). Gorgas Memorial Labs, 25 km NE of Cerro Azul on Río Piedras, *Mori & Kallunki 3465* (MO). Tumba Muerto Road, *Standley 29816* (US). Near Arraijan, *Woodson et al. 776* (MO). SAN BLAS: Río Cuadi, ca. 6 mi SW of Mulatupu, *Duke 14210* (F, MO). Headwaters of Río Cuadi, Camp Diabolo (Drill Site 22), *Duke et al. 3616* (MO, SCZ), *3655* (MO). VERAGUAS: Coiba Island, *Collenette 466* (US). COLOMBIA: CHOCO: Madurex Logging Camp, *Duke 9973* (MO).

76. **Psychotria pubescens** Swartz, Nov. Gen. Sp. Pl. Prodr. 44. 1788. TYPE: not seen.

P. hebeclada DC., Prodr. 4: 513. 1830. TYPE: not seen.

Shrubs or small trees, to 4 m tall, the branchlets terete to angular, the indumentum variable, rarely glabrescent, the nodes well spaced, the stem often conspicuously constricted below the node. *Leaves* lanceolate to oblong lanceolate, 8–17 cm long, 3.0–8.5 cm wide, acuminate at the apex, often abruptly so, acute or attenuate at the base, the lateral veins 9–18, often purple, membranous, puberulent to glabrate above, puberulent beneath; petioles slender, to 2 cm long, puberulent; stipules tending to persist, connate, the sheath to 2 mm long, the awns linear, to 5 mm long, conspicuously puberulent to pilose. *Inflorescences* greenish, terminal, usually solitary, paniculate, shorter than the terminal leaves, to 12 cm long, the lateral branches opposite or whorled, the rachis usually purple, the basal branches to 3 cm long, the uppermost gradually shorter; bracts linear, to 1.5 cm long, puberulent. *Flowers* on short pedicels; hypanthium short, subrotund, to 1.5 mm long, pubescent, the calycine cup scarcely measurable, glabrous or puberulent, usually with ca. 3 minute glands at the junction of the lobes, the lobes 5, unequal, oblong to deltoid, 0.1–0.5(–1.5) mm long, ciliolate; corolla white, yellow or green, the tube cylindrical, ca. 5 mm long, puberulent outside, pilose within near the filament attachment and pubescent near the mouth, the lobes (4–)5, 2–3 mm long, glabrous within; stamens 5, the anthers oblong, 1.0–

1.8 mm long, obtuse, the filaments 0.5–1.0 mm long; stigmas 2, erect or deflexed, 0.3–0.65 mm long, the style 3.0–4.5 mm long, crassate, the ovarian disc mound shaped or oblong rotund, to 7 mm long. *Fruits* subrotund, 3.0–4.5 mm long, the calycine cup persistent, glabrescent, the pyrenes 2, 4–5-costate on the surface.

Psychotria pubescens is common throughout Mexico and Central America.

Seibert 435 (MO) from El Valle is different from other Panamanian material as the inflorescences are few-flowered. "Iskarmas Tumat"; "Tibisci" (Bayano Cuna).

CANAL ZONE: Cocoli, *Riley 174* (MO). Madden Dam, *Seibert 561* (MO). 1 mi below Chilibre, *Seibert 1502* (MO). Curundu, *Tyson 1046, 1047, 1050* (all MO). Fort Clayton, *Tyson 1284* (MO). Curundu, *Tyson 1322* (MO). 6 mi N of Gamboa, *Tyson 1479* (MO). Farfan Beach, *Tyson 1829* (MO). Curundu, *Tyson 4173* (MO); *Tyson & Dwyer 4454* (MO). Miraflores Lake, *White 247* (MO). Ancón Hill, *Woodson et al. 718* (MO). BARRO COLORADO ISLAND: *Croat 10846, 10919* (both MO); *Shattuck 883, 1070* (both MO). CHIRIQUÍ: Boquete, savannas, 4000 ft, *Davidson 846* (MO). COCLÉ: El Valle, *Seibert 435* (MO). COLÓN: Behind Portobelo, *Croat & Porter 15599* (MO). Portobelo, *Ebinger 126* (MO). Colon to Portobelo, 0.6 km from Portobelo, *Folsom 3758* (MO). DARIÉN: Río Urutí, *Bristan 221* (MO). Río Tuqueza below Quebrada Venado, *Bristan 1071* (MO). Río Pirre, *Croat & Porter 15513* (MO). Río Bayano, near Panamerican Highway, *Duke 4001* (MO). El Real to Pinogana, *Duke 5154* (MO). Río Chucunaque near Pinogana, *Duke 5178* (MO). Río Pucro to Quebrada Maskia, *Duke 13066* (MO). Río Bayano, above Piria, *Duke 14400* (MO). Río Tuquesa, lower Tuquesa mining camp called Charco Chiva, *Mori 6936* (MO). 1 mi from Pinogana near Quebrada Chiuto, *Stern et al. 122* (MO). Paya, Río Paya, *Stern et al. 178* (MO). PANAMÁ: Juan Diaz, *Castillo 27* (MO). Road to Cerro Campana, 3 mi from Interamerican Highway, *Croat 12049* (MO). Río Bayano, near Panamerican Highway, *Duke 4001* (MO). Tocumen, *Dwyer 1853* (MO). El Llano, *Gentry 5562* (MO). Chilibre, *Mosley 28* (MO). 2 mi E of El Llano, *Tyson 1738* (MO). 4 mi W of Chepo near Panamerican Highway, *Tyson 6742* (MO). Tocumen, *Villamil 24* (MO). Arraijan, *Woodson et al. 1360* (MO). Isla Taboga, *Woodson et al. 1525* (MO). SAN BLAS: N of Mandinga airport, *Duke 14845* (MO). Río Diabolo and Río Acuatí, Nargana, *Duke 14864* (MO). Mainland opposite Achituppu, *Lewis et al. 111* (MO). Mainland opposite Ailigandí, *Lewis et al. 177* (GH, K, MO, UC, US). VERAGUAS: Río Trinidad, below Río de Jesus, *Dwyer 1315* (MO).

77. **Psychotria pumiliocarpa** Dwyer.[111] TYPE: Panama, *Maas & Dressler 1612* (MO, holotype).

Shrubs 1.0–1.7 m tall, the branchlets smooth, wiry, glabrous or moderately appressed villose, the hairs white, the nodes well spaced. *Leaves* elliptic oblong or lanceolate, 6.5–14.5 cm long, 2–4 cm wide, acute or acuminate, the acumen triangular, to 1.5 cm long, occasionally falcate, acute or attenuate acute and usually slightly inequilateral at the base, the costa slender, often rubescent, prominulous above and beneath, the lateral veins 15–20, arcuate, joining to form an indistinct undulate submarginal vein, chartaceous, discolorous or concolorous, glabrous above except occasionally scattered villosulose on the costa above, the costa and lateral veins beneath with spreading, short, white or golden hairs, the intervenal areas with short, appressed, strigose hairs; petioles slender, to 1.8 cm long, puberulent; stipules connate, the sheath turgid, truncate, 2–4 mm long, each

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[111] *Psychotria pumiliocarpa* Dwyer, spec. nov. *Suffrutices* ad 1.7 m alti, ramulis laevibus gracilibus. *Folia* elliptico-oblonga vel lanceolata, 6.5–14.5 cm longa, 2–4 cm lata, acuta acuminataque venis lateralibus 15–20, membranacea vel tenui-chartacea in costa venisque subtus minute aureo-puberula interveniis ciliis brevibus appressis strigosis albis praeditis; petiolis ad 2.8 cm longis. *Inflorescentiae* terminales, ca. 6.5 cm longae, ca. 4 cm latae, ramis ca. 4 jugis dispositis. *Fructus* sessiles oblongi-rotundi pyrenis 2.5–3.0 mm longis laevibus glabris profunde costatis.

part with 2 well spaced awns as long as or slightly longer than the sheath, puberulent. *Inflorescences* terminal, cymose paniculate, often drying red, to 6.5 cm long, to 4 cm wide, the peduncle, if present, 2–4 cm long, slender, deflexed, if absent, then with 2 axes arising from the tip of the twiglet, the branches disposed as 2–3 well spaced pairs, the lowermost opposite, the others mostly alternate, spreading, the cymes few flowered; bracts subulate to narrowly oblong, 2–4 mm long. *Flowers* (only partly seen) sessile; hypanthium oblong, less than 1 mm long, pubescent, the calycine cup somewhat saucer shaped, ca. 0.2 mm long, scarious, the margin wavy, the teeth not evident; corolla and stamens not seen; ovarian disc about as long as the calycine cup, the style ca. 1 mm long. *Fruits* sessile, small, oblong-rotund, the pyrenes 2.5–3.0 mm long, smooth, glabrous, replete with cystoliths, deeply ribbed, the traces of the calyx scarcely measurable.

Psychotria pumiliocarpa is known only from Panama. It is distinguished by a combination of characters: membranous or thin chartaceous leaves, connate stipules with 2 erect awns, a toothless saucerlike calyx, and small fruit.

VERAGUAS: Alto de Piedra, forest, 800 m, *Maas & Dressler 1612* (MO).

78. **Psychotria quadrangulata** Dwyer.[112] TYPE: Panama, *Mori & Kallunki 5363* (MO, holotype).

Trees, 10 m tall, the twiglets slender, 4-angled, the bark smooth, glabrous, the nodes widely separated, to 10 cm apart. *Leaves* 6–19 cm long, 2–8 cm wide, obtuse or deltoid at the apex, the acumen triangular, 0.5–1.0 cm long, ultimately acute or obtuse, cuneate to obtuse at the base, the costa subplane to prominulous above, scarcely prominent beneath, drying dull pink, to 0.15 cm wide proximally, the lateral veins 9–10, prominulous beneath, arcuate, not forming an obvious submarginal vein, drying yellow red, the margin delicately callose, chartaceous, mostly somewhat discolorous, glabrous above, beneath minutely puberulent on the costa and the veins and with a few scattered elongate hairs on the costa; petioles slender, stiff, to 2.5 cm long, to 0.2 cm wide, with a few scattered hairs; stipules persistent, perhaps briefly connate, the sheath compressed rotund, 3–5 mm long, each part with 2 erect horns, ca. 4 mm long, glabrous. *Inflorescences* terminal, cymose-paniculate, often pyramidal, 6–10 cm long, to 5 cm wide at the base; peduncle 4–5 cm long, slender, rigid, minutely puberulent; bracts and bracteoles minute, ovate, deciduous, the basal branches usually opposite, occasionally 4-verticillate, the branches above usually 4-verticillate, well separated from the lowermost branches, the terminal branches few, reduced, the cymules few, few flowered, patulous. *Flowers* sessile or subsessile, the hypanthium 0.5–0.7

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[112] *Psychotria quadrangulata* Dwyer, spec. nov. *Arbores* 10 m alti ramulis glabris quadrangulatis. *Folia* 6–19 cm longa, 2–8 cm lata, venis lateralibus 9–10, chartacea subtus in costa venisque minuto-puberula; petiolis gracilibus, ad 2.5 cm longis; stipulis persistentibus fortasse breviter connatis vagina compresso-rotunda, 3–5 mm longa bicornuata. *Inflorescentiae* terminales cymoso-paniculatae, 6–10 cm longae, pedunculo 4–5 cm longo, ramis inferioribus oppositis vel 4-verticillatis cymulis paucis paucifloris patulis. *Flores* lobis calycis oblongo-rotundis, 0.5–0.7 mm longis.

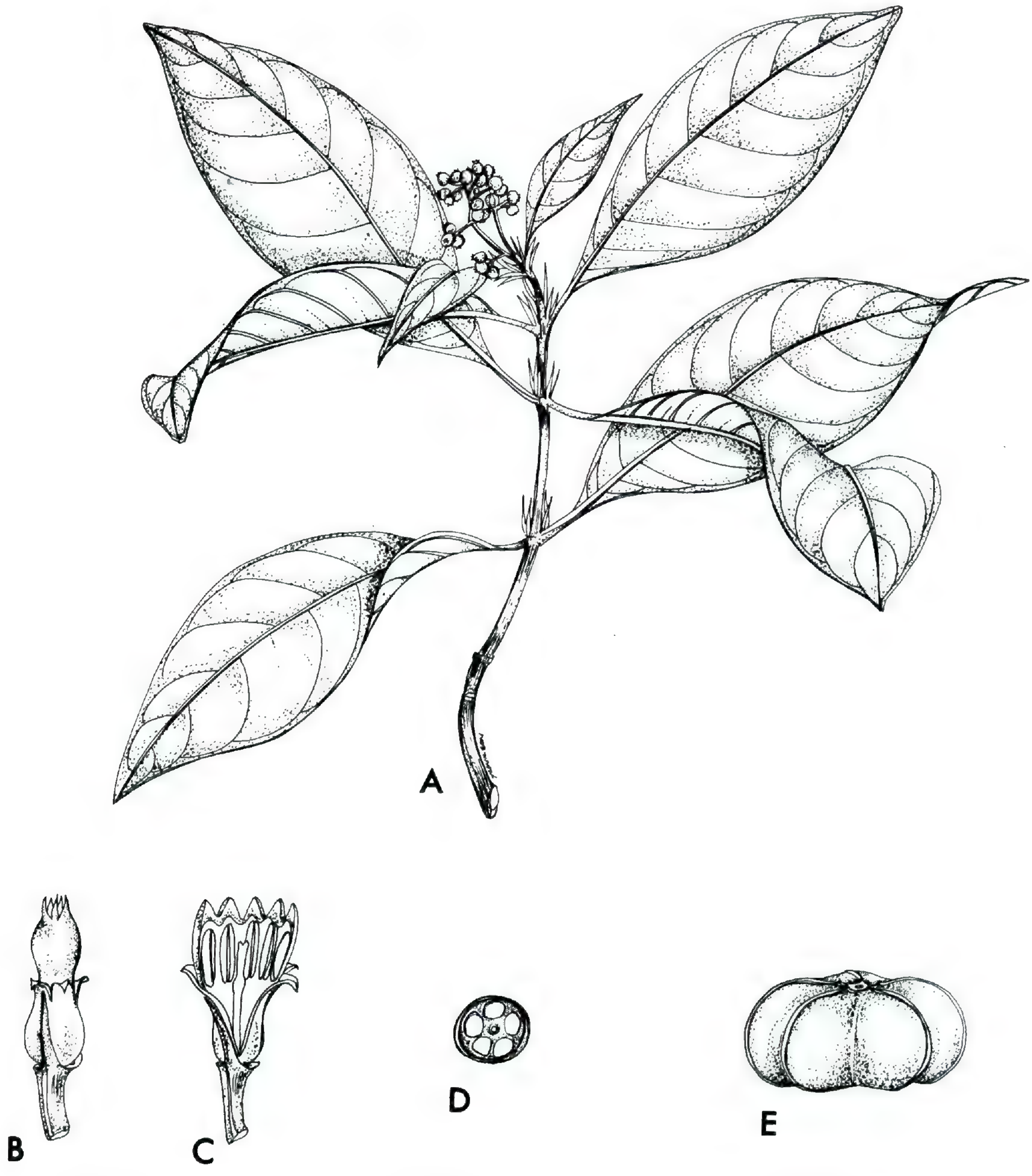

FIGURE 76. *Psychotria racemosa* (Aubl.) Raeuschel.—A. Habit (×3/5).—B. Flower (×6).—C. Flower opened to show interior (×6).—D. Ovary, cross section (×6).—E. Fruit (×6). [After *Hayden 128.*]

mm long, glabrous or with a few short hairs, the calycine cup short, the lobes oblong rotund, 0.5–0.7 mm long; corolla (immature) glabrous outside. *Fruits* not seen.

Psychotria quadrangulata is known only from Panama.

VERAGUAS: NW of Santa Fe, 2.7 km from Escuela Agricola Alto de Piedras, road to Calovéboro, *Mori & Kallunki 5363* (MO).

79. **Psychotria racemosa** (Aubl.) Raeuschel, Nomen, Ed. 3: 56. 1797.—FIG. 76.

P. racemosa (Aubl.) Rich., Actes Soc. Hist. Nat. Paris 1: 107. 1792.
Nonatelia racemosa Aubl., Hist. Pl. Guiane Fr. 186. 1775. TYPE: in sylvis territorii Orapu, French Guiana, *Aublet*, not seen.

Shrubs to 1½ m tall, the branchlets slender, terete, smooth, minutely puberulent, sometimes contracted below the nodes, the latter well spaced. *Leaves* oblong or lanceolate, occasionally subfalcate, to 18 cm long, to 8 cm wide, cuspidate at the apex, the cusp to 1 cm long, acute to attenuate acute at the base, usually equilateral, the costa prominulous above, prominulous to subprominent beneath, to 0.13 cm wide at the base, the lateral veins 12–14, widely arcuate, prominulous, the veinlets prominulous, membranaceous to chartaceous, smooth, glabrous; petioles to 3 cm long, to 1.3 mm wide; stipules tending to persist, erect, free, the body scarcely measurable or to 1.5 mm long, the lobes 2, subulate, 8–13 mm long, glabrous, fimbriate within. *Inflorescences* usually terminal, solitary, shortly pedunculate, 2–5 cm long, about as long as broad. *Flowers* with the hypanthium short, glabrate, the calycine cup scarcely measurable, lacking glands within, the teeth irregular and unequal, subulate to oblong rotund, to 0.8 mm long, acute and/or obtuse; corolla white, the tube cylindrical, 2.5 mm long, petaloid, glabrous or papillose puberulent outside, villose within near the filament attachment, the lobes oblong or ovate oblong, 0.8 mm long, cucullate, often papillate puberulent within; stamens 5, oblong, ca. 1 mm long, attached above the middle of the tube; stigmas 5, linear subulate, ca. 0.7 mm long, the style slender, 2 mm long, often papillate puberulent; the ovary 5-celled. *Fruits* usually somewhat congested, rotund, 5–6 mm in diam., 5-lobed, maturing from orange red to black; pyrenes ca. 3 mm long, lightly costate.

This species is widespread throughout tropical America and is immediately recognized by the 5-carpellate ovary and fruit.

BOCAS DEL TORO: Halfway between Quebrada Huron and Puerto Palenque, *Kirkbride & Duke 505* (MO). Punta Pena, near Chiriquicito, *Lewis et al. 2144* (MO, UC, VEN), *2147*, *2153* (both MO). Fish Creek Mountains, *Wedel 2265* (MO). CANAL ZONE: Gamboa Pipeline, *Correa & Haines 482* (MO). Drowned Forest, Quebrada Bonita, *Dodge & Allen 17068* (MO). Drowned Forest, Quebrada Ancha, *Dodge & Steyermark 17044* (MO). George Greene Memorial, Madden Forest, *Dwyer & Hayden 11* (MO). Coco Solo, *Gentry 6422* (MO). Madden Dam Road, *Hayden 75* (MO). Fort Clayton, *Hayden 174* (MO). Pipeline Road, Río Agua Salud, *Kennedy 1856* (MO). 8 km NW of Gamboa, *Nee 8433* (MO). Splice S16 and S49, Río Indio, *Steyermark & Allen 17454* (MO). Cocoli, *Tyson 1617* (MO). 1 mi N of Summit Garden, *Tyson & Blum 1949* (MO). George Greene Forest Preserve, *Tyson et al. 2505* (MO). BARRO COLORADO ISLAND: *Aviles 44*, *88A* (both MO); *Croat 4031A*, *5750A*, *5971*, *6182*, *6189A*, *6199A*, *6763*, *10338*, *10842*, *10929*, *11246*, *11475*, *15116*, *16533* (all MO); *Hayden 128* (MO), *1027* (GH, MO, UC, US); *Hladick s.n.* (MO); *Killip 39961* (MO); *Shattuck 26* (MO). CHIRIQUÍ: San Bartolome, *Woodson & Schery 881* (MO). COLÓN: 4 km NW of Salamanca, 3 km NE of Buenos Aires, 340–410 m, *Nee 9090* (MO). DARIÉN: Río Yape, *Bristan 1390* (MO). Río Chico, from Yaviza to ca. 1 hr by outboard from junction with Río Chucunaque, *Burch et al. 1122* (F, GH, K, MO, UC, US). Río Tucutí ca. 2 hrs by outboard above Tucutí, *Duke 5268* (MO). 10 mi S of El Real, *Duke 5416* (MO). Near Tusijuanda, 1 day up Río Balsa from Manené, *Duke 13529* (MO). Ca. 1 mi SE of Río Tuira, Interamerican Highway, *Duke 14568* (MO). River Ganglon, *Duke & Bristan 368* (MO). 1–3 mi N of Paya, *Duke & Kirkbride 14007* (MO). Between Paya and Palo de los Letras, *Duke & Kirkbride 14032* (MO). Caná, *Stern et al. 461*, *470* (both MO). 3 mi E of Santa Fé, *Tyson et al. 4696* (MO). LOS SANTOS: Headwaters of Río Pedregal, 25 mi SW of Tonosí, *Lewis et al. 2900* (MO, UC). PANAMÁ: Río La Maestra, *Allen 2* (MO). Juan Diaz, *Castillo 15* (MO). Jenine, *Duke 3803*, *3877* (both MO). Río Pita, 1–3 mi above confluence with Río Maestra, *Duke 4767* (MO). Piria-Cañasas Trail near Piria, *Duke 14350* (MO). Goofy Lake, Cerro Azul, *Dwyer & Hayden 8023* (GH, MO, US). Río Pasiga, near Waterfall, *Gentry 2281* (MO). 5 mi SW of Cerro Brewster, *Lewis et al. 3525* (MO). Chimán, *Lewis*

et al. 3235 (COL, DUKE, K, MO, UC, VEN). 6.5 km by road N of Lago Cerro Azul, 650–730 m, *Nee 9302* (MO). Cerro Jefe, *Wilbur et al. 11336* (MO). SAN BLAS: E of Cangandí-Mandinga Airport, *Duke 14770* (MO). Río Diabolo and Río Acuati near Nargana, *Duke 14874* (MO).

80. **Psychotria rosulatifolia** Dwyer.[113] TYPE: Panama, *Gentry & Mori 14174* (MO, holotype).—FIG. 77.

Herbs to 0.5 m tall, the stems smooth, drying brown, the lenticels small, diffuse, pustulate, the nodes moderately well spaced except at the apex of the twiglets. *Leaves* sessile, obovate oblong or obovate, occasionally subspathulate, 18–31 cm long, 8–9 cm wide, acute or deltoid toward the apex, acuminate, the acumen conspicuous, to 2.5 cm long, falcate, ultimately subacute, somewhat attenuate toward the base or below the middle of the blade, finally truncate or subauriculate basally, the costa subimmersed above, prominent beneath, the lateral veins 20–30, spreading at first perpendicular to the costa then widely arcuate, plane above, prominulous beneath, subrubescent when dry, with a conspicuous paralleling vein ca. 2 mm from the margin, the intervenal areas spreading reticulate, stiffly membranous, glabrous above, puberulent beneath on the costa and the veins; stipules free, ovate lanceolate, to 1.5 cm long, ca. 1.8 cm wide, acute, truncate at the base, scarious, glabrous, the median vein prominulous. *Inflorescences* terminal, solitary, cymose paniculate, the peduncle to 9 cm long, ca. 0.12 cm wide, obtusely angular, the primary basal branches paired, opposite, to 4.5 cm long, the upper primary branches disposed as 2 sets of 3 well-spaced whorls, the secondary branches few, similarly disposed; lowermost bracts ovate oblong, to 3 mm long, spreading, glabrous, resembling the stipules in texture. *Flowers* sessile or with pedicels to 2 mm long; hypanthium ca. 1.5 mm long, glabrous; calycine cup cylindrical or cup shaped, ca. 1 mm long, truncate, glabrous, the teeth as 5 scarcely measurable points; corolla white, the tube cylindrical, 3.2–6.0 mm long, 1.2–1.5 mm wide in the middle, glabrous outside, villosulose within near filament attachment, the lobes 5, narrow oblong, 3–4 mm long, ca. 1 mm wide, narrow toward the apex, erect as bud opens, reflexed at anthesis, with a linear, adaxial spur, 0.3–0.6 mm long, 1.0–1.5 mm below the tip of the lobe; stamens 5(–6), narrowly oblong, ca. 2 mm long, obtuse to truncate, the scarcely measurable filament affixed near the middle of the tube; ovarian disc 0.8–1.0 mm long; style 2.2–5.0 mm long, the stigmatic lobes 2, scarcely wider than the style, 0.2–0.4 mm long. *Fruits* oblong, to 5 mm long, each pyrene 4-ribbed, glabrous, red when dry, the calyx often persistent, to 0.5 mm long.

Psychotria rosulatifolia is known only from Panama. It is distinguished from all other *Psychotria* by the sessile many-nerved leaf blades disposed in rosette fashion at the apex of the branchlets. The slender subterminal adaxial appendage on each corolla lobe is diagnostic. The auriculate character of the blades is especially striking for a *Psychotria*.

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[113] *Psychotria rosulatifolia* Dwyer, spec. nov. *Herbae* ad 0.5 m altae. *Folia* sessilia obovato-oblonga vel obovata subspathulata venis lateralibus 20–30 rigido-membranacea supra glabra infra puberula; stipulis liberis ovato-lanceolatis, ad 1.5 cm longis, ca. 0.8 cm latis, acutis vena media vix prominula praeditis. *Inflorescentiae* (in fructu visae) terminales cymoso-paniculatae pedunculo ad 9 cm longo, ramis 3 ascendentibus terminato, inferioribus ad 4 cm longis, his dichotome vel trichotome ramificantibus, bracteis inferioribus ovato-oblongis ad 3 mm longis, glabris. *Fructus* oblongi, ad 5 mm longi, pyrena utraque 4-costata glabra in sicco rubra calyce ad 0.5 mm longo.

DARIÉN: Ascent of Cerro Pirre, Río Pirre, S of El Real, 750–1030 m, *Duke 5339* (MO). Cerro Pirre, mossy forest, 2500–4500 ft, *Duke & Elias 13788* (MO). Cerro Pirre, vicinity of Rancho Plastico, *Folsom 4295* (MO). Trail from Río Pucro, base camp up W ridge of Cerro Mali, wet forest, 640–1000 m, *Gentry & Mori 14174* (MO).

81. **Psychotria sanfelicensis** Dwyer.[114] TYPE: Panama, *Mori & Kallunki 5871* (MO, holotype).

Shrubs to 2 m tall, branching freely, the ultimate branchlets glabrous, slender, smooth, the nodes well spaced. *Leaves* elliptic or oblong-elliptic, 2.5–6.0 cm long, 1.3–2.2 cm wide, conspicuously attenuate toward the apex, often abruptly acuminate, the acumen to 1.5 cm long, acute, basally attenuate, the costa prominulous on both sides, the lateral veins 9–10, joining to form an irregular vein to 1 mm from the margin, slender, arcuate, the smaller veins between pairs of lateral veins soon branching, the intervenal areas spreading reticulate, the margin thinly callous, chartaceous, discolorous, yellow green when dry beneath, glabrous; petioles slender, to 1 cm long, glabrous; stipules ?connate, the body cupuliform, to 1.5 mm long, the margin undulate, the teeth 4, minute, to 0.3 mm long, similar in aspect to the teeth of the calyx, glabrous. *Inflorescences* terminal, pyramidal paniculate, to 8 cm long, to 6 cm wide, glabrous, the peduncle to 2.5 cm long, 0.1 cm wide, the branches few, opposite, the lowermost to 3 cm long, the secondary branches occasionally opposite, the lowermost to 3 cm long, the cymules few, unilaterally disposed; bracts and bracteoles subulate, the lowermost bracts subulate, to 6 mm long. *Flowers* (only one partly seen) with the hypanthium subrotund, 1 mm long, glabrous, the cystoliths abundant, the calycine cup 0.3–0.6 mm long, the teeth 5, scarcely visible or to 0.3 mm long, truncate; ovarian disc longer than the calyx. *Fruits* (?immature) oblong, to 3 mm long, obtuse, glabrous, the cystoliths dense, the calyx persistent.

Psychotria sanfelicensis is known only from Panama.

CHIRIQUÍ: N of San Félix on Cerro Colorado copper mine road, along continental divide, lower montane rain forest (cloud forest, trees to 5 m tall) 5000–5500 ft, *Mori & Kallunki 5871* (MO).

82. **Psychotria santaritensis** Dwyer.[115] TYPE: Panama, *Dwyer & Gentry 9565* (MO, holotype).—FIG. 78.

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[114] *Psychotria sanfelicensis* Dwyer, spec. nov. *Suffrutices* ad 2 m alti ramulis ultimis glabris. *Folia* elliptica vel oblongo-elliptica, 2.5–6.0 cm longa, 1.3–2.2 cm lata, acumine ad 1.5 cm longo, venis lateralibus 9–10, chartacea omnino glabra; petiolis ad 1 cm longis; stipulis fortasse connatis vagina ad 1.5 mm longis, margine undulato dentibus 4 ad 0.3 mm longis. *Inflorescentiae* terminales, ad 8 cm longae, ad 6 cm latae, glabrae; pedunculo ad 2.5 cm longo, ramis paucis oppositis inferioribus ad 3 cm longis, cymis paucis unilateraliter dispositis; bracteis ad 6 mm longis. *Flores* cupula calycis dentibus 5 vix visibilibus vel ad 0.3 mm longis, truncatis; disco ovarii quam calyce longiore. *Fructus* oblongi, glabri.

[115] *Psychotria santaritensis* Dwyer, spec. nov. *Arbores* ad 20 m altae, ramulis glabris. *Folia* ovato-rotunda vel lato-oblonga, 5–19 cm longa, 2.2–12.6 cm lata, apicem versus rotunda, venis lateralibus 8–13 rigido-striatis, tenui coriacea in sicco sordido-flava supra minuto-farinosa subtus albido-puberula; petiolis ad 1.5 cm longis; stipulis ad 5 mm longa truncata cuspidibus 2 solum ad 1.2 mm longis, coriaceis glabris. *Inflorescentiae* terminales paniculatae, ad 9.5 cm longae, ad 8 cm latae. *Flores* (in gemmis) sessiles cupula calycis nulla lobis 5 rotundis vel ovato-oblongis, 0.5–1.0 mm longis; corolla tubo 3 mm longo, extus puberulo; antheris ca. 2 mm longis. *Fructus* oblongo-rotundi, ad 0.9 cm longi, glabri.

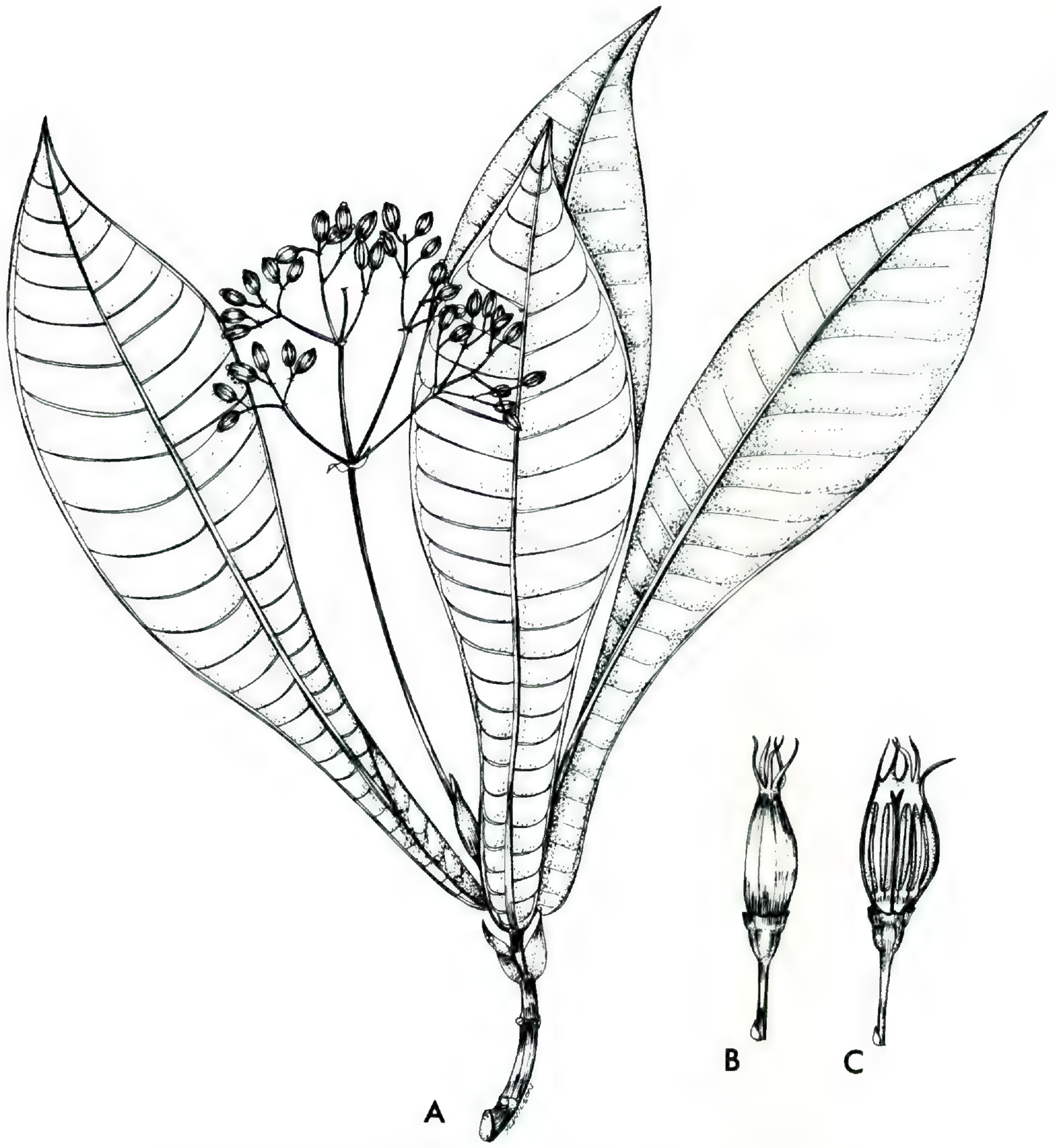

FIGURE 77. *Psychotria rosulatifolia* Dwyer.—A. Habit (×½).—B. Flower (×5).—C. Flower opened to show interior (×5). [After *Gentry & Mori 14174*.]

Trees to 20 m tall, the branchlets at first terete, ultimately angular, smooth, glabrous, the nodes well spaced, often turgid. *Leaves* ovate rotund or widely ovate oblong, 5–19 cm long, 2.2–12.6 cm wide, rounded toward the apex, acuminate, the acumen short, deltoid, to 0.4 cm long, obtuse, basally rounded or truncate, the costa prominulous above, prominent beneath, to 0.22 cm wide, the lateral veins 8–13, rigidly striate, prominent beneath, the proximal veins subperpendicular, the distal veins arcuate, the veins between a pair of lateral veins 1–3, oblique, soon branching, the secondary veins irregularly pinnatiform, thinly coriaceous, drying a dirty yellow, concolorous, minutely farinose above, white puberulent beneath; petioles thick, to 1.5 cm long, to 0.22 cm wide, rigid, black, minutely pubescent; stipules often persistent, ?connate, turgid, each part square

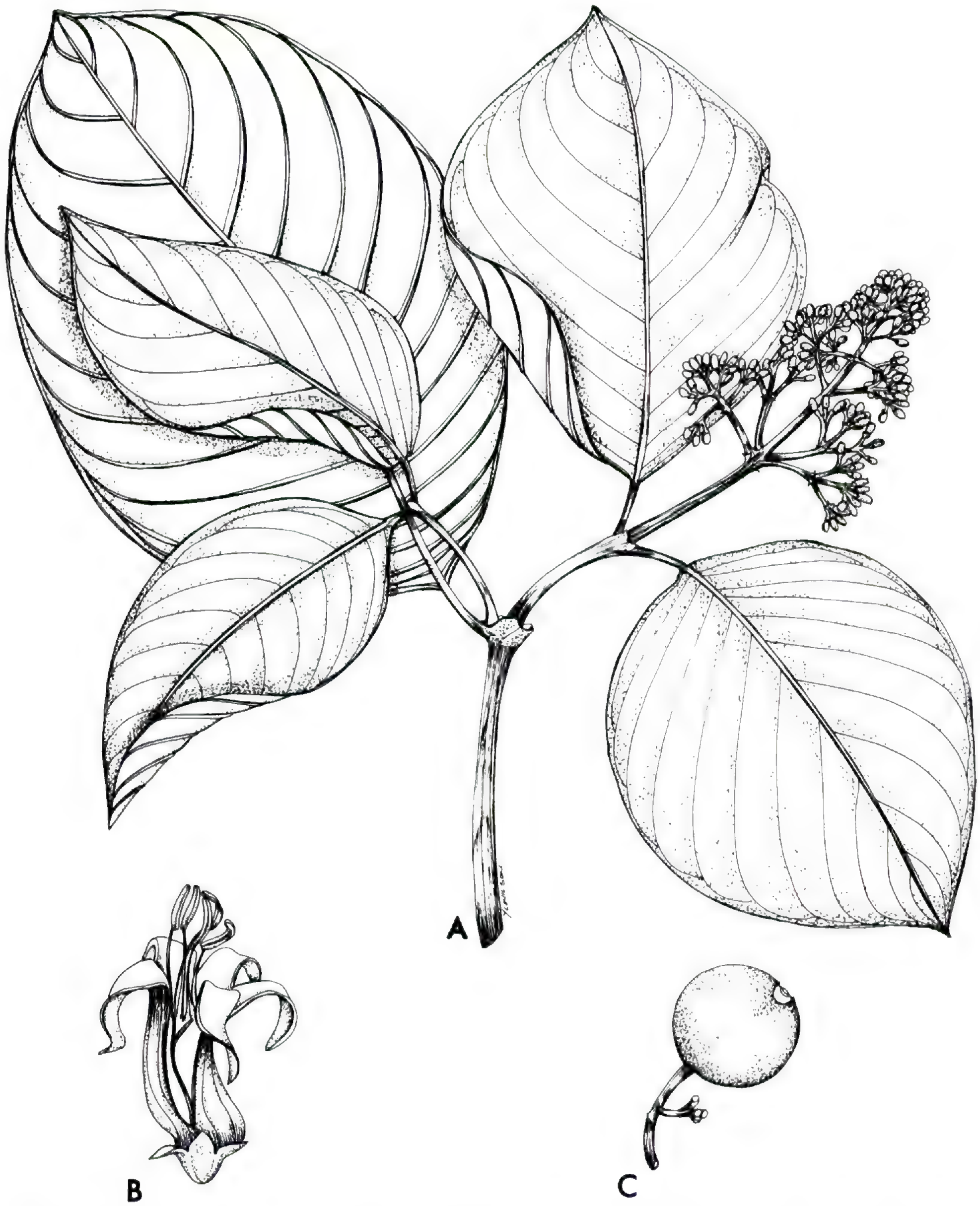

FIGURE 78. *Psychotria santaritensis* Dwyer.—A. Habit (×½).—B. Flower partly opened to show interior (×3).—C. Fruit (×1½). [After *Dwyer & Gentry 9565.*]

or subrotund, to 5 mm long, often wider than long, with 2 short, well-spaced cusps, to 1.2 mm long, coriaceous, glabrous, black or dark when dry. *Inflorescences* terminal, paniculate, oblong or pyramidal, to 9.5 cm long, to 8 cm wide, drying black, puberulent, the peduncle to 3 cm long, plane, often twisted, the branches verticillate, the lowermost 3–4, to 4 cm long, spreading, the upper branches few; bracts minute, subulate, ca. 0.5 mm long. *Flowers* (in bud) sessile; hypanthium oblong rotund, 1 mm long, puberulent, the calycine cup scarcely measurable, the lobes 5, rounded or ovate oblong, 0.5–1.0 mm long, obtuse, often

spreading and saucer shaped, puberulent; corolla white, the tube to 3 mm long, carnose, puberulent outside, glabrous within except densely white villose near the base; stamens 5, the anthers narrowly oblong, ca. 2 mm long, obtuse, the style 0.5 mm long, the stigmas 2, linear oblong, 2 mm long, obtuse, plane. *Fruit* (2 seen) sessile, oblong rotund, to 0.9 cm long, rounded, vaguely didymous, noncostate, drying black, glabrous, minutely punctate, the calyx remnants inconspicuous.

Psychotria santaritensis is known only from Panama. It is distinguished by its thinly coriaceous leaves with rigid striate veins; the leaf blades dry a dirty yellow. The large noncostate fruit is diagnostic. *Folsom 2537* describes the flowers as "wine and milk."

COLÓN: Santa Rita logging road, *Correa & Dressler 1208* (MO). El Llano-Cartí Road, 23.4 km from Interamerican Highway, *Mori & Kallunki 5578* (MO). El Llano-Cartí Road 17.5 km from Interamerican Highway, *Mori et al. 4956* (MO). PANAMÁ: Santa Clara near Agua Clara Weather Station, *Dwyer & Gentry 9565* (MO). El Llano to Carti Road, 6 km N of Panamerican Highway, *Folsom 2537* (MO).

83. **Psychotria santa-rosae** Standley, Publ. Field Columbian Mus., Bot. Ser. 7: 113. 1930. TYPE: Colombia, *Killip 11530* (US, holotype).

Subshrubs to 0.5 m tall, the twigs slender, angular, the hairs diffuse, golden, weak, more dense near the nodes, to 2 mm long, the nodes well spaced. *Leaves* widely elliptic oblong, 15–20 cm long, 7.0–10.5 cm wide, deltoid at the apex, acuminate, the acumen widely triangular, to 2 cm long, falcate, ultimately acute, widely cuneate to obtuse at the base, rarely truncate, the costa prominulous above, scarcely prominent beneath, the lateral veins 15–17, arcuate, the undulate submarginal vein ca. 4 mm from the margin, the intervenal areas spreadingly reticulate, membranous, conspicuously discolorous, dark violet purple beneath, often with spreading and somewhat stiff golden hairs; petioles slender, to 3 cm long, ciliate; stipules ovate oblong, to 2.5 cm long, with 2 hornlike processes, each triangular, golden ciliate. *Inflorescences* axillary; peduncle 6–7 cm long, 0.2 cm wide, densely golden villose, the flowers aggregated into 3 heads, the lower 2 heads terminating short branches, to 1 cm long, the upper heads to 2.5 cm long, to 1.8 cm wide, the rachis 1–2 cm long; bracts at the base of the lower branches subulate, to 0.8 cm long; exterior bracts of the heads oblong, to 6.5 cm long, often shortly acuminate at the apex, petaloid, venose, glabrous except the margin densely golden ciliate, the hairs to 1.2 mm long, sometimes the margins with 1–2 short lobes. *Flowers* (only 1 hypanthium and calyx seen) sessile, the hypanthium ca. 1 mm long, densely golden ciliate; calyx teeth 5, subulate, 2.0–2.5 mm long, often unequal, the hairs rigid, tufted. *Fruits* blue, sessile, rotund, to 3 mm long, the hairs weak, white, few, sulcate, black when dry.

Psychotria santa-rosae is known only from Panama and Colombia. Killip indicated that the type collection was a tree to 12 ft tall, while *Gentry and Clewell* (*7026*) note it was a subshrub to 0.5 m tall. It bears a close relationship to *P. pilosa*.

DARIÉN: Summit of Cerro Pirre, 1000–1400 m, *Gentry & Clewell 7026* (MO).

84. **Psychotria siccorubra** Dwyer.[116] TYPE: Panama, *Mori 6781* (MO, holotype).—FIG. 79.

Shrubs to 2 m tall, the branchlets slender, branching freely, glabrous, the nodes well spaced. *Leaves* subsessile, ascending, lanceolate, occasionally ovate lanceolate, 3.5–8.0 cm long, 1.3–3.0 cm wide, attenuate toward the apex, acuminate, the acumen to 1 cm long, ultimately acute, basally cuneate or rarely obtuse, the costa prominulous above and below, red when dry, slightly alate, the lateral veins 9–12, slender, prominulous, widely arcuate, the submarginal vein to 0.2 cm from the margin, the margin slightly revolute, glabrous above, glabrate beneath; stipules often persistent on the ultimate branches, seemingly connate, the sheath short, ca. 2 mm long, glabrous, truncate, each part with subulate setas to 4 mm long. *Inflorescences* terminal, to 2.2 cm long, the peduncle to 1.2 cm long, slender, glabrous, the flowers few in a solitary bracteate head, to 1.2 cm long; bracts ca. 7, erect, acute, glabrous, venose, rigidly papyraceous, the outer bracts ovate oblong, to 13 mm long, to 7.5 mm wide, the interior bracts narrowly lanceolate, to 8.5 mm long, to 0.2 mm wide. *Flowers* sessile; hypanthium and calycine cup 2 mm long, glabrous with minute glandular spots within, the teeth 5, ca. 0.3 mm long; corolla white, bright red when dry, the tube infundibuliform, 5–7.5 mm long, ca. 1.5 mm wide in the middle, glabrous outside, pubescent within above the middle, the lobes 5, narrowly ovate oblong, 1.7–2.5 mm long, obtuse; stamens 4–5, narrowly oblong, ca. 2.2 mm long, obtuse, the filaments 2.5 mm long, attached near the middle of the tube; style ca. 4 mm long, the stigmas 2, narrowly oblong, ca. 1.5 mm long, the ovules obovate oblong, 0.35–0.50 mm long, obtuse, plano compressed. *Fruits* oblong, to 0.6 cm long, smooth, glabrous, the surface moderately rugose, each pyrene with obtuse and prominulous ribs.

Psychotria siccorubra is known only from Panama. The individual flowers including the hypanthium and the calyx dry a brilliant red, although the surrounding bracts and bracteoles do not. *Sullivan 304* notes that the flowers are "white, turning red with age." The fruits are larger than most Panamanian *Psychotria*; they possibly were collected in an immature state. While there is no doubt that *Sullivan 304* is conspecific with the type, I noted that the anthers seem regularly 4 in place of 5, and are less than ½ the length of those of the type. The 2 stigmatic lobes measured only 0.3 mm in length in contrast to about 1.5 mm long in the type. The styles in both collections are of comparable length and the anthers seemed affixed to the corolla tube at about the same level, thus ruling out heterostyly.

CHIRIQUÍ: Cerro Colorado, on road 28 km from Rio San Felix bridge, ca. 1500 m, *Sullivan 304* (MO). VERAGUAS: Cerro Tute, ridge top, above 1000 m, *Mori 6781* (MO).

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[116] *Psychotria siccorubra* Dwyer, spec. nov. *Frutices* ad 2 m alti ramulis glabris. *Folia* subsessilia lanceolata interdum ovato-lanceolata, 3.5–8.0 cm longa, 1.3–3.0 cm lata, acumine ad 1 cm longo, venis lateralibus 9–12 chartacea super glabra subtus glabrata; stipulis ut videtur connatis vagina brevi, ca. 2 mm longa, glabra truncata parte utraque setis subulatis ad 4 mm longis. *Inflorescentiae* terminales, ad 2.2 cm longae, pedunculo ad 1 cm longo, floribus paucis in caespitem unum bracteatum, ad 1.2 cm longum, bracteis ca. 7 erectis exterioribus ovato-oblongis, ad 13 mm longis, ad 7.5 mm latis, glabris. *Flores* hypanthio et cupula calycis ca. 2 mm longa, dentibus ca. 0.3 mm longis; corolla alba in sicco forte rubra tubo 5.0–7.5 mm longo, lobis 1.7–2.5 mm longis; antheris ca. 2.2 mm longis, filamentis brevibus proxime medium tubi affixis. *Fructus* oblongi, ad 0.6 cm longi, glabri.

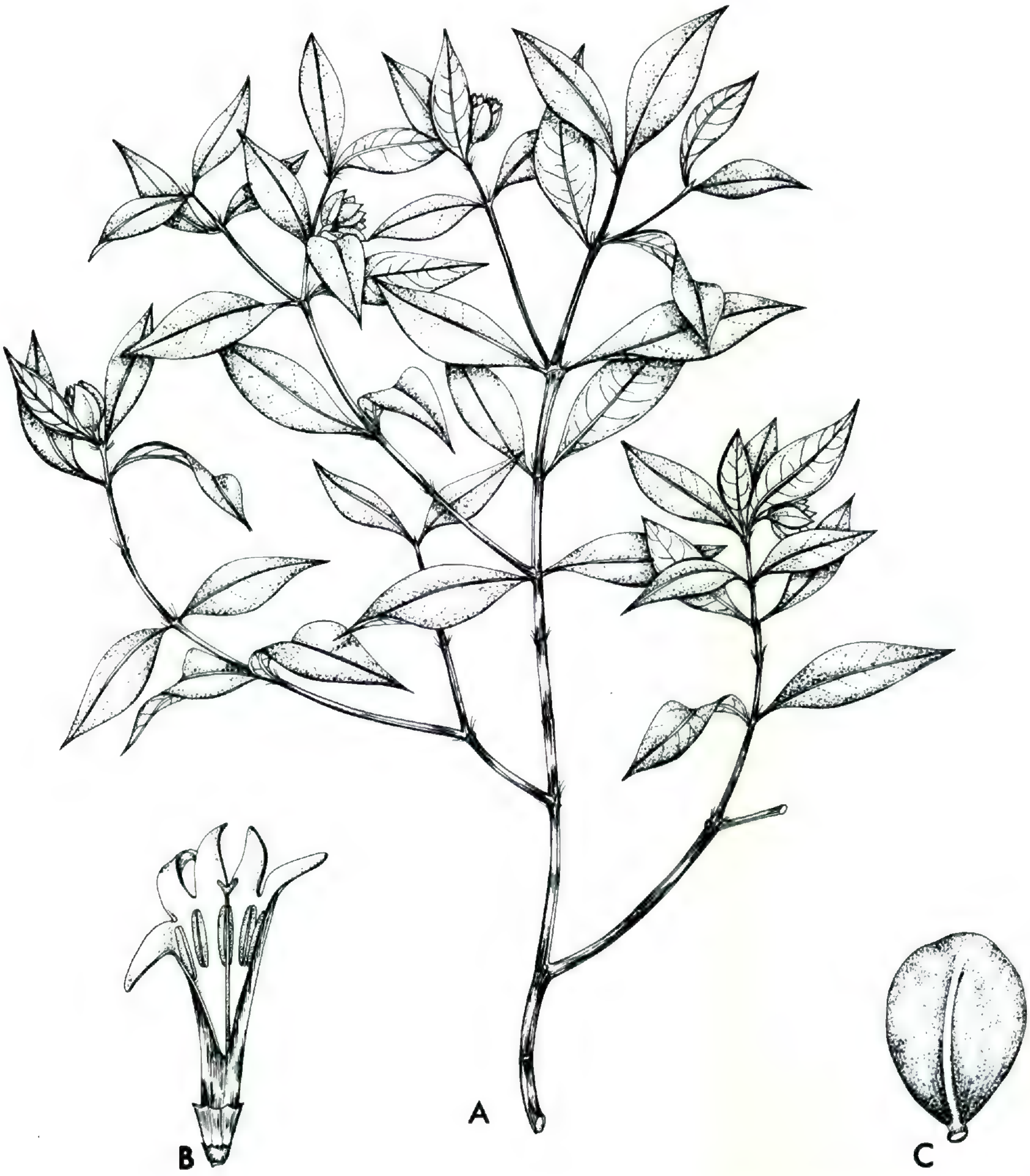

FIGURE 79. *Psychotria siccorubra* Dwyer.—A. Habit (×½).—B. Flower opened to show interior (×3½).—C. Fruit (×3½). [After *Mori 6781*.]

85. **Psychotria siggersiana** Standley, J. Wash. Acad. Sci. 15: 289. 1925. TYPE: Costa Rica, *Standley 37210* (US, holotype).

P. tonduzii Standley, J. Wash. Acad. Sci. 15: 287. 1925. TYPE: Costa Rica, *Standley 39461* (US, holotype).

Shrubs 1–2½ m tall, the stems simple, lignose, to 2 cm wide, glabrous, green when dry, the pith often conspicuously porate, the nodes moderately spaced, the scars of the stipules ringlike. *Leaves* large, ascending, widely elliptic oblong or oblong, 22–42 cm long, 9–14 cm wide, acute toward the apex, acuminate, the acumen scarcely visible or to 1 cm long, basally acute or attenuate acute, often slightly inequilateral, the costa subplane above, prominulous beneath, plano com-

pressed, the lateral veins (10–)14–16, arcuate, slender, prominulous beneath, not joining to form a delicate submarginal vein close to the margin and parallel to it, stiffly chartaceous, rarely membranous, concolorous or discolorous, gray green when dry, both sides with curled and bulbous-based hairs, the latter well spaced above, beneath stiff or curled, dense, short; petioles elongate, to 8.5 cm long, 0.2–0.35 cm wide, puberulent; stipules often deciduous, connate, turgid, cup shaped or widely cylindrical, to 0.8 cm long, often wider than long, thin and scarious, glabrous, each part often bearing a prominulous median scale to 4 mm long, 2.3 mm wide, fimbriate. *Inflorescences* axillary, 9–11 cm long, to 16 cm wide, cymose paniculate, puberulent, the peduncle to 4.5 cm long, flexuous, angular ascending, or suberect, the branches few, opposite, the pairs often only 2, the cymules crowded at the apex, the bracts narrowly oblong or linear subulate, to 0.7 cm long, obtuse, the external bracteoles crowded, subulate, to 1 cm long. *Flowers* sessile; hypanthium short, glabrous, the calycine cup greenish white, the teeth 5, short, triangular, 0.4 mm long, scarious except for the thinly membranous margin, densely ciliate; corolla white (in bud), the tube cylindrical below the middle, expanded above the middle, carnose, villosulose outside, perhaps glabrous within, the lobes 5, cucullate, externally gibbous; stamens 5, the anthers narrowly oblong, 1 mm long, the filaments short; ovarian disc large, compressed rotund, about equal to the calycine teeth, the style slender, the stigmas short. *Fruits* oblong rotund or rotund, to 5.5 mm long, obtuse, smooth, violet, purple, or red, drying gray or orange, minutely punctate, maturing red, each pyrene strongly convex outside, the wall thin, often with a few prominulous ribs giving an alate appearance, glabrous, the endocarp within with a flat, median keel, the seed filling the locule, in shape similar to the pyrene except concave on the internal surface.

Psychotria siggersiana Standley is known only from Costa Rica and Panama. The red fruit on drying appears like a greenish white tennis ball, but sometimes may dry red. The stipules are connate and usually have a basal fimbriate scale on each side of the sheath. In herbarium material the stipules are difficult to discern; they are deciduous except at the apex of the stem.

COCLÉ: Cerro Gaital Caracoral, 2700–3200 ft, *Dwyer & Correa A. 8916* (MO). DARIÉN: Cerro Pirre, 1200 m, *Folsom 4267, 4483* (both MO); *Gentry & Clewell 7036* (MO). Headwaters of Rio Tuquesa, vicinity of Gold Mine Camp, *Tyler et al. 27190* (MO). PANAMÁ: Campos Tres, 3 mi NE of Altos de Pacora, 500–800 m, *Croat 22747* (MO). VERAGUAS: Valley Rio Dos Bocas between Escuela Agricola Alto Piedra and Calovébora, 15.6 km NW of Santa Fe, 450–550 m, *Croat 27697* (MO). 1 km past Agricultural School, road from Santa Fe, *Folsom & Collins 1633* (MO). Caribbean slope above Río Primero Brazo, 5 mi NW of Santa Fe, *Liesner 991* (MO). NW of Santa Fe, 8.8–11.0 km from Escuela Alto de Piedra, *Mori et al. 3804, 3826* (both MO). First branch of Rio Santa Maria, road from Santa Fe, *Witherspoon & Dressler 8919* (MO).

86. **Psychotria solitudinum** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 207. 1940. TYPE: Costa Rica, *Skutch 4347* (F, holotype; NY, isotype).

Shrubs or small trees, to 2.5 m tall, the branchlets slender, smooth, 4-angled, the nodes usually well spaced and turgid. *Leaves* oblong, often widely so, 5–20 cm long, 2–8 cm wide, obtuse or deltoid at the apex, often acuminate, the acumen erect or falcate, to 1.5 cm long, obtuse to subcuneate at the base, often subinequi-

lateral, the costa prominulous above and beneath, the lateral veins 13–15, at first strict then widely arcuate, with subparallel irregular veins, these soon branching, the veinlets of intervenal areas patulous reticulate, especially evident beneath, stiffly chartaceous, discolorous, usually drying olive silver beneath, glabrous or with the costa laterally villose; petioles to 3.5 cm long, 0.8–1.5 cm wide, glabrous; stipules connate, cylindrical, subrotund, 2–4 mm long, 3–5 mm wide, scarious, glabrous, each part 2-lobed, triangular and spreading, usually much shorter than the body, obtuse or acute. *Inflorescences* terminal, solitary, paniculate, as long as or shorter than the uppermost leaves, the peduncle to 7.5 cm long, glabrous or minutely puberulent, the primary branches opposite, the superior branches few, patulous, to 4 cm apart, to 4 cm long, the tertiary branches simple or branching dichotomously, the cymules sessile, few flowered, often well spaced along the ultimate branches and giving a nodose and zig-zag effect; bracts and bracteoles subulate, those of the main branches to 4 mm long, acute, somewhat deflexed. *Flowers* sessile, the hypanthium 0.5 mm long, the cup oblong, 2.2 mm long, inflated, petaloid, villose outside, glabrous and eglandular within, the margin erosulose or the teeth scarcely discernible, irregular; corolla yellow or yellow green, the tube (in bud) carnose, pubescent, glabrous inside, the lobes 5, distinctly galeate; anthers 1.1 mm long; style short; stigmas 2, digitiform. *Fruits* lilac (fide *Duke 9586*).

Psychotria solitudinum occurs in Costa Rica, Panama, and Colombia. Standley described the corolla of the type collection in some detail (from Latin): "corolla in bud at the apex shortly and obtusely 5-tuberculate, densely short pilose on the outside, on expanding 7–8 mm long, yellow, the tube very short, glabrate, abruptly expanded into a mouth, 3.0–3.5 mm wide."

BOCAS DEL TORO: Buena Vista near Almirante, *Cooper 585* (US). COCLÉ: Alto Calvario, 7 km N of El Cope, 700–900 m, *Folsom 3202* (MO). DARIÉN: Road to Río Tucuti, 2 hrs upstream by piragua above Tucutí, *Duke 5262* (MO). Cerro Pirre, cloud forest, *Duke 6093* (MO). Peak ca. 300 ft high between Río Balsa and Río Aretí, *Duke 8738* (MO). Cerro Campamento, S of Cerro Pirre, *Duke 15711* (MO). Cerro Pirre, 2500–4500 ft, *Duke & Elias 13674* (MO, UC, VEN). Between Río Perecenico and Rancho Frio, 500–2500 ft, *Duke & Elias 13890* (MO). El Real, slopes of Cerro Pirre, 500–1000 m, *Foster & Kennedy 1264* (MO). PANAMÁ: Cerro Campana, bald savannalike areas, road toward top, *Duke 6023* (MO). VERAGUAS: N of Santa Fé, property of Escuela Agricola Alto de Piedra, *Mori & Kallunki 2534* (MO). COLOMBIA: CHOCO: Between Río Curiche and Alto Curiche, *Duke 9586* (MO).

87. **Psychotria tacarcunensis** Dwyer.[117] TYPE: Panama, *Gentry & Mori 13974* (MO, holotype).

Shrubs 1–2 m tall, branching freely, the branchlets terete, densely arachnoid villosulose, the nodes well spaced. *Leaves* elliptic or sometimes somewhat ovate

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[117] *Psychotria tacarcunensis* Dwyer, spec. nov. *Frutices* ad 1 m alti ramulis dense arachnoideo-villosulis. *Folia* elliptica vel interdum vix ovato-elliptica, 5.5–13.0 cm longa, 1.8–3.5 cm lata, apice et basi acuta, venis lateralibus ca. 14, tenui-chartacea supra glabrata subtus in venis costaque ciliata; petiolis ad 1.3 cm longis; stipulis connatis cylindricis, ad 1 cm longis, setis subulatis 2 utraque parte praedita. *Inflorescentiae* terminales solitariae paniculatae, ad 8.5 cm longae, ad 3 cm latae, cymis floribus paucis; bracteis lineari-subulatis, ad 1.5 cm longis. *Flores* sessiles; cupula calycis dentibus 5 inconspicuis; corolla tubo ad 5 mm longo, extus puberulo; antheris ad 1.5 mm longis connectivo prominenti in dorso. *Fructus* compresso-rotundi, ad 5.5 mm in diam., glabri costati aurantiaci.

elliptic, 5.5–13.0 cm long, 1.8–3.5 cm wide, acute at the apex, the acumen to 1.5 cm long or absent, basally acute, the costa prominulous above and beneath, the lateral veins ca. 14, arcuate, not usually forming a submarginal vein, red when dry, with several branching and evanescent smaller veins between the lateral veins, thinly chartaceous, brown above when dry, tan brown beneath, glabrate above, beneath the veins and venules with short, rigid, spreading hairs; petioles slender, to 1.3 cm long; stipules connate, cylindrical, 0.4–1.0 cm long, each part with 2 subulate, widely spaced, erect awns about equal to the sheath or much shorter. *Inflorescences* terminal, solitary, cymose paniculate, 8.5 cm long, 1–3 cm wide, densely golden pubescent, the hairs short, stiff; peduncle 0.8–3.0 cm long, 0.1 cm wide, the branches giving a racemose appearance, few, opposite or alternate, the lowermost pair always opposite, rigid, angular ascending or deflexed, the cymes few, the flowers congested; bracts and bracteoles linear subulate, to 1.5 cm long, or those at the base of the lowermost branches similar to the leaves but shorter and narrower. *Flowers* sessile; hypanthium 0.5 mm long, the calycine cup cupuliform, to 0.6 cm long, wider than long, petaloid, eglandular within, villosulose outside, the teeth 5, inconspicuous; corolla with the tube cylindrical, to 5 mm long, puberulent outside, the lobes perhaps 5, narrowly lanceolate, 2.5 mm long, pilose outside; stamens perhaps 5, the anthers exserted, oblong, to 1.5 mm long, obtuse, dorsifixed, the connective prominent, the filaments short, attached near the mouth, the style not seen. *Fruits* sessile, compressed rotund, wider than long, to 5.5 mm in diam., glabrous, drying black, obtusely costate, the persistent calyx short, orange.

Psychotria tacarcunensis is known only from Panama. It is distinguished by the webby pubescence of branchlets, the elongate bracts, and the anther connective which is conspicuously thickened on the back.

DARIÉN: Elfin forest, top of W peak of Cerro Tacarcuna massif, 1800–1850 m, canopy 5–6 m, *Gentry & Mori 13974* (MO). Cerro Tacarcuna massif between summit camp on westernmost ridge and Pico Tacarcuna, mostly elfin forest, *Gentry et al. 16938* (MO). S slope of westernmost peak of Cerro Tacarcuna massif, lower montane forest, 1500–1600 m, *Gentry et al. 16952* (MO).

88. **Psychotria taurina** Dwyer.[118] TYPE: Panama, *Wedel 2240* (MO, holotype).

Trees to 7 m tall, the branchlets terete, smooth, at first glabrous, ultimately densely pilose, the hairs sometimes densely aggregated and deflexed. *Leaves* oblong, obovate oblong, often somewhat inequilateral, 11–16 cm long, 5–10 cm wide, deltoid, rounded or obtuse at the apex, acuminate, the acumen to 1.5 cm long, ultimately acute, basally cuneate, the costa slender, prominulous above and beneath, the lateral veins ca. 12, arcuate, the intervenal areas smooth, the smaller veinlets disappearing, spreading reticulate, membranous, concolorous when dry,

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[118] *Psychotria taurina* Dwyer, spec. nov. *Arbores* ad 7 m altae. *Folia* oblonga vel obovato-oblonga, 11–16 cm longa, 5–10 cm lata, venis lateralibus ca. 12, membranacea; petiolis ad 1.2 cm longis; stipulis triangulari-oblongis, 7–13 mm longis, acutis glabratis. *Inflorescentiae* terminales paniculatae ad 5 cm longae, ad 2.5 cm latae, dense albido-villosae, pedunculis ad 1.8 cm longis, ramis inferioribus 3–4 verticillatem dispositis floribus paucis, bracteis ad 4.5 mm longis. *Flores* sessiles, dentibus calycis ca. 0.5 mm longis; corolla tubo ad 6.5 mm longo extus sparse pubescente intus aggregatis ciliorum alborum prope faucem; antheris oblongis, ca. 0.9 mm longis.

glabrous above except pubescent on the costa and veins, sparsely villose beneath, the hairs to 0.6 mm long; petioles to 1.2 cm long, white villose; stipules often persistent, triangularly oblong, 0.7–1.3 cm long, acute, thin, concave, glabrate, drying red. *Inflorescences* solitary, terminal, paniculate, to 5 cm long, to 2.5 cm wide, densely white villose, the peduncles to 1.8 cm long, 0.1 cm wide, the lowermost branches 3–4, verticillately disposed, the upper branches few, alternate, the flowers few; bracts subulate, 3.5–4.5 mm long, white villose on the margins. *Flowers* sessile, the hypanthium compressed rotund, 0.5 mm long, hirsute, the calycine cup short, the teeth 5, triangular, 0.5 mm long, acute, appearing irregular because of the rigid, elongate hairs outside; corolla white, the tube to 6.5 mm long, 0.4–0.7 mm wide in the middle, outside sparsely pubescent, rubescent, within with bunches of white hairs near the mouth, the lobes ovate, 3 mm long, glabrous inside, pubescent outside; stamens 5, the anthers oblong, 0.9 mm long, the filaments attached near the mouth; ovarian disc ringlike, the style linear, 4 mm long. *Fruits* not seen.

Psychotria taurina is known only from Panama. It bears a striking resemblance to *P. pubescens* Swartz. The new species is a much larger tree with much more elongate stipules with larger awns. The ovarian disc of the new species is annular while that of *P. pubescens* is hemispherical.

BOCAS DEL TORO: Fish Creek Mountains, Chiriquí Lagoon, *Wedel 2240* (MO).

89. **Psychotria trichotoma** Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 11: 227. 1844. TYPE: not seen.

Trees 4–8 m tall, the branchlets terete, smooth, glabrate, the nodes well spaced. *Leaves* elliptic, often narrowly so, often falcate, 7–18 cm long, 1.8–6.5 cm wide, deltoid, acute to vaguely obtuse at the apex, the acumen 1–2.5 cm long, attenuate, acute at the base, the costa prominulous above and beneath, the lateral veins (6–)9–12, arcuate ascending, stiffly chartaceous, concolorous, usually drying green or gray green, glabrous above, puberulent to glabrous beneath, the intervenal areas smooth, the petioles 1.5–3.5 cm long, 0.8–2.0 mm wide, glabrate, the stipules deciduous (fide Steyermark). *Inflorescences* terminal, shorter than the uppermost leaves, 4.0–7.5(–11.0) cm long in fruit; peduncle to 4 cm long with few branches, these well spaced, opposite or 4-radiate, each branch often bifurcate. *Flowers* scarcely pedicellate, the hypanthium turbinate, glabrous, rubescent, the calycine cup short, patulous, the teeth evanescent, the corolla white, inflated cylindrical, to 3 mm long, glabrous outside, the lobes shorter than the tube, puberulent only at the base within, the stamens exserted. *Fruits* glabrous, 0.6–1.2 cm long, subrotund, oblong, compressed oblong or obovate, drying black or red, conspicuously obtusely ribbed, the calyx not persistent, the pedicels 0.8 cm long.

COCLÉ: Cerro Pilón, ca. 3100 ft, *Dwyer 8326* (MO). PANAMÁ: Trail to top of Cerro Campana, *Mori & Kallunki 2491* (MO). El Llano-Cartí Road, 9.6–11.0 km from Interamerican Highway, 350 m, *Mori & Kallunki 3533* (MO). Trail to top of Cerro Campana, 10 km SW of Capira, 800 m, *Mori & Kallunki 3556* (MO). VERAGUAS: 5 mi W of Santa Fé, road past Escuela Agricola Alto Piedra, 800–1200 m, *Croat 23037* (MO). Alto Piedra, Santa Fé, *Lao 519* (MO). N of Santa Fé, Escuela Agricola Alto de Piedra, *Mori & Kallunki 2510, 2519, 2571, 2638* (all MO). NW of Santa Fé, *Mori & Kallunki 4745, 4786, 4868, 5325* (all MO).

90. **Psychotria tutensis** Dwyer.[119] TYPE: Panama, *Mori 6783* (MO).

Small *trees* to 3 m tall, the branchlets smooth, glabrous, sharply ascending, the nodes well spaced, sometimes turgid. *Leaves* oblong rotund or occasionally ovate rotund, 4.0–7.5 cm long, 2–4 cm wide, widely deltoid or rotund toward the apex, acuminate, the acumen conspicuous, to 1 cm long, ultimately acute, basally obtuse, rotund or widely cuneate, the costa prominulous above and beneath, the lateral veins ca. 7, arcuate, prominulous, the intervenal areas spreading reticulate, rigidly papyraceous, concolorous, green when dry, glabrous; petioles to 1.5 cm long, to 0.1 cm wide, rigid, glabrate; stipules connate, the sheath scarcely turgid, 1 mm long, truncate but each part with 2 awns, to 0.5 cm long, well spaced. *Inflorescences* terminal, cymose-paniculate, to 8 cm long, to 5 cm wide, glabrous, the peduncle 3.0–3.5 cm long, terminated by 3 branches, umbellately disposed, the 2 lateral branches strongly and rigidly ascending, to 2 cm long, the flowers few, the bracts and bracteoles often deciduous, subulate, 0.5–1.0 mm long. *Flowers* sessile, the buds often slightly curved, the hypanthium 0.8 mm long, glabrous, the calycine cup cupuliform, turgid, 0.5 mm long, the lobes 5, widely triangular, 0.3 mm long, glabrous to minutely puberulent; corolla white, the tube narrowly cylindrical, 6.5–10.0 mm long, glabrous outside, within densely villose above or near the middle, the lobes 5, narrowly oblong, 6 mm long, 1.5 mm wide, obtuse, glabrous; stamens 5, exserted, the anthers linear ovate, to 3.5 mm long, sagittate basally, the filaments dorsifixed, 1–2 mm long, slender, affixed near the mouth; ovarian disc 0.7 mm long, truncate or bilobed, drying black, the style slender, 7–8 mm long, the stigmas 2 mm long, the ovules 2, obovate oblong, 0.5 mm long, obtuse, affixed basally, the septum thick.

Psychotria tutensis is known only from Panama. It is distinguished by its oblong-rotund or ovate-rotund leaves and its flower buds which resemble those of *Coussarea* in being curved. The anthers are narrow and are almost completely exserted at anthesis. The 2 basally affixed ovules separated by a wide septum preclude the species being a *Coussarea*.

VERAGUAS: Cerro Tute, ridgetop cloud forest, above 1000 m, *Mori 6783* (MO). Cerro Tute, ca. 10 km NW of Santa Fe, ridgetop cloud forest, above 1000 m, *Mori et al. 7578* (MO).

91. **Psychotria uliginosa** Swartz, Nov. Gen. Sp. Pl. Prodr. 43: 1788. TYPE: Jamaica, not seen.—FIG. 80.

Notopleura uliginosa (Swartz) Brem., Recueil Trav. Bot. Néerl. 31: 289. 1934.
Uragoga uliginosa (Swartz) Kuntze, Rev. Gen. Pl. 2: 963. 1891.
Psychotria laevis DC., Prodr. 4: 505. 1930.
P. phytolacca Spreng. ex DC., Prodr. 4: 505. 1930.

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[119] *Psychotria tutensis* Dwyer, spec. nov. *Arbores* ad 3 m altae, ramulis glabris. *Folia* oblongo-rotunda vel interdum ovato-rotunda, 4.0–7.5 cm longa, 2–4 cm lata, versus apicem lato-deltoidea vel rotunda acumine ad 1 cm longo, basi obtusa rotunda et lato-cuneata venis lateralibus ca. 7 rigido-papyracea; petiolis ad 1.5 cm longis; stipulis connatis vagina vix turgida ca. 1 mm longa truncata sed parte utraque setis 2 ca. 0.5 cm longis. *Inflorescentiae* terminales cymoso-paniculatae, ad 8 cm longae, ramis 3 umbellate dispositis. *Flores* sessiles gemmis saepe modice curvatis; cupula calycis turgida lobis solum 0.3 mm longis, glabris; corolla tubo ca. 6.5 mm longo, extus glabro lobis ad 6 mm longis; antheris lineari-ovatis, ad 3.5 mm longis. *Fructus* non visi.

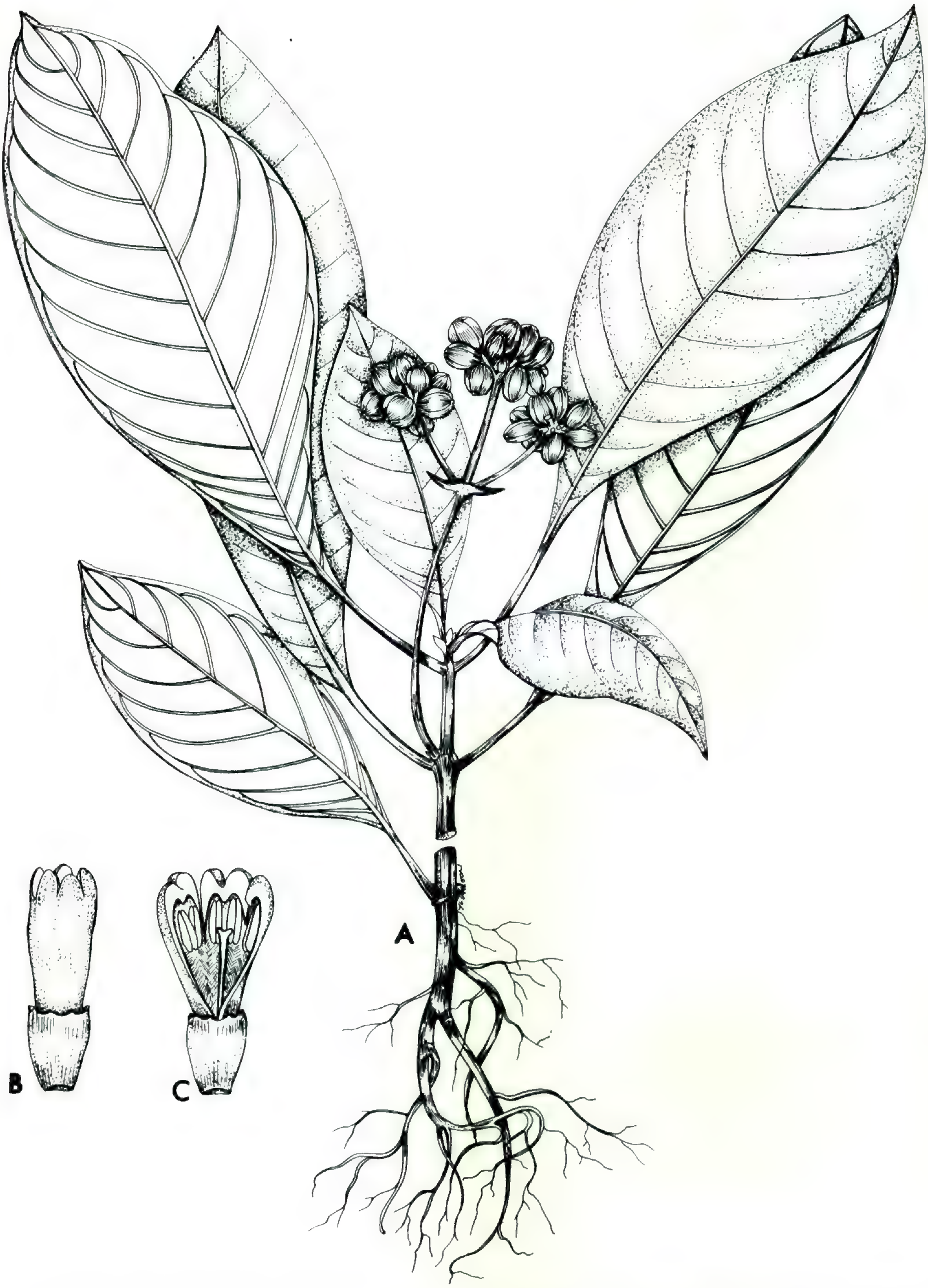

FIGURE 80. *Psychotria uliginosa* Swartz—A. Habit (×½).—B. Flower (×7½).—C. Flower opened to show interior (×7½). [After *Dwyer 8562*.]

Subshrubs to 1½ m tall, usually ca. ½ m tall, the branchlets terete, smooth, drying black, glabrous, the nodes well spaced. *Leaves* oblong or lanceolate, to 24 cm long, to 11 cm wide, rounded to acute at the apex, usually with a cusp to 1.2 cm long, cuneate at the base, rarely inequilateral, the costa subplane to prominulous above, usually subplane beneath, the secondary veins ca. 12, widely arcuate, subplane above and beneath, the intervenal areas smooth, the veinlets not usually evident, drying dark brown or green brown above, tan beneath, glabrescent to minutely puberulent above and beneath; petioles to 7 cm long, to 0.35 cm wide, smooth, glabrous; stipules deciduous but the bases often persistent, free, hemispherical, to 4 mm long, glabrous, stiff. *Inflorescences* axillary, usually ascending, the peduncles one per axil, 6–12 cm long, to 0.4 cm wide, angular, glabrous, terminated by a small aggregation of cymules, or branching dichotomously once or twice and terminating in conglomerate cymules, or disposed as a panicle with 1 or 2 pairs of well spaced rigid-ascending opposite branches, these terminating in conglomerate cymules, the bracteoles small. *Flowers* minute; hypanthium subrotund, ca. 1 mm long, glabrous, the calycine tube 0.7–1.5 mm long, carnose, eglandular but with abundant raphides within, puberulent outside, the teeth absent or scarcely evident; corolla white, the tube cylindrical, somewhat turgid, ca. 2 mm long, carnose, glabrous outside, densely villose above the middle inside, the lobes 5, oblong, to 1.5 mm long, ca. 0.7 mm wide, cucullate at the apex; stamens 5, the anthers oblong, ca. 1 mm long, 0.2 mm wide, dorsifixed, the filaments short, attached near the mouth; stigmas 2. *Fruits* bright red, sessile, oblong or ovate oblong, to 1 cm long, 0.5–0.8 cm wide, occasionally with the calycine cup persistent, to 1 mm long, each pyrene with a median rib, smooth, glabrous.

This species extends from southern Mexico to Colombia and Ecuador. It also occurs in the West Indies.

BOCAS DEL TORO: Río Terebe, foothills of Cerro Bonyic, *Kirkbride & Duke 412* (MO). Duwebdulup Peak, N of Río Terebe, *Kirkbride & Duke 570* (MO). Quebrada Menaco and Buena Vista Chiriquí Trail, *Kirkbride & Duke 673* (MO). Chiriquí Lagoon, *Wedel 1123* (MO). Fish Creek Mountains, *Wedel 2229* (MO). CANAL ZONE: Río Indio, *Dodge & Allen 17302* (MO). 10 km NW of Gamboa, *Nee 9601* (MO). Barro Colorado Island, *Starry 90* (MO). CHIRIQUÍ: Cerro Colorado, 1500 m, *Folsom & Collins 1762, 1811* (both MO). COCLÉ: El Valle, *Bartlett & Lasser 16697* (MO). La Mesa, *Croat 13364* (MO). Cerro Pilón, *Croat 13456* (MO). El Valle, *Croat 14283* (MO). Cerro Pilón, *Duke & Lallathin 14979* (MO); *Dwyer 8335* (MO). Cerro Gaital Caracoral, *Dwyer & Correa 8876* (MO). Cerro Pilón, *Kirkbride 1061* (MO); *Lallathin 30-4* (MO). El Valle, *Lewis et al. 1776* (MO, UC); *Luteyn & Kennedy 1693* (MO). Cerro Pilón, *Porter et al. 4445, 4582* (both MO). El Valle, *Woodson & Schery 170* (MO). COLÓN: Santa Rita Ridge, *Dwyer 8562* (MO). DARIÉN: Cerro Pirre, *Bristan 471* (MO). Río Pirre, *Bristan 1485* (MO). Camp Summit between Mortí and Sasardí, *Duke 10029, 10671* (both MO). Upper Río Membrillo and Camp 7, *Duke 10925* (MO). Demartaganala (Summit Camp), *Duke 15830* (MO). El Cerro, *Duke & Bristan 1485* (MO). Puerto St. Dorothea, *Dwyer 2262* (MO). Caná-Cuasi Trail (Camp 2) Chepigana, *Terry & Terry 1434* (MO). LOS SANTOS: Loma Prieta, *Duke 11850* (MO); *Lewis et al. 2190* (COL, MO, UC, VEN). PANAMÁ: Cerro Campana, *Bartlett & Lasser 16931* (MO); *Croat 12154, 14199, 14719* (all MO). Cerro Azul, *Dwyer 4343* (MO). Cerro Jefe, *Dwyer 8221* (MO). Cerro Azul, *Dwyer & Hayden 8040* (GH, MO, UC, US). Cerro Campana, *Dwyer & Kirkbride 7857* (MO). Chagres, *Fendler 42* (MO). El Llano-Carti Road, 6.9 km N of Panamerican Highway, *Folsom 1443* (MO). Cerro Campana, *Kirkbride 239* (MO). Cerro Trinidad, *Kirkbride & Duke 1663* (MO). Cerro Campana, *Lewis et al. 1940* (GH, MO, UC, US), *3060* (MO, UC, VEN); *Luteyn 981* (MO). Cerro Jefe, *Luteyn 1324* (MO). Trail to top of Cerro Campana, *Mori & Kallunki 2743* (MO). Cerro Campana, 870–1000 m, *Mori & Kallunki 3566* (MO). El Llano-Cartí Road, 5 km N of Panamerican

Highway, *Nee 7925* (MO). El Llano-Cartí Road, 16 km N of Panamerican Highway, 400–450 m, *Nee & Dressler 9343* (MO). Cerro Campana, *Porter et al. 4225* (MO), *4883* (COL, DUKE, MO, SCZ, UC, VEN). Cerro Azul, *Tyson 2110* (MO). Cerro Campana, *Witherspoon & Witherspoon 8454* (MO). SAN BLAS: El Llano to Carti Road, 16.5 km N of Panamerican Highway, *Folsom 2594* (MO). VERAGUAS: Santa Fe, Cerro Tute, 2500 ft, *Allen 4370* (MO). Caribbean slope above Rio Primero Brazo, 700–1200 m, *Croat 23242* (MO). Valley Rio Dos Bocas, 15.6 km NW of Santa Fe, 450–550 m, *Croat 27602* (MO). Above Santa Fe beyond Escuela Agricola Interam., *Croat 34181* (MO). 0.2 mi beyond fork road to Escuela Agricola Alto Piedras, *Croat & Folsom 33847* (MO). 7 km NW, road to Santa Fé, *D'Arcy 10277* (MO). 8.9–5.0 m N of Santa Fé, 500–1000 m, *Gentry 2976* (MO). Above Santa Fé, Cerro Tute, 1200–1400 m, *Gentry 6239* (MO). Mouth of Río Concepcion, *Lewis et al. 2800* (COL, MO, UC, VEN). N of Santa Fé, ca. 2 km N of Escuela Agricola Alto de Piedras, *Mori & Kallunki 2570* (MO). Cerro Tute, 750–1000 ft, 10 km NW of Santa Fe, *Mori et al. 7538* (MO). 3–4 km by road W of Santa Fe, ca. 2500 ft, *Nee 11302* (MO).

92. **Psychotria umbelliformis** Dwyer & Hayden, Ann. Missouri Bot. Gard. 55: 44. 1968. TYPE: Panama, *Kirkbride & Duke 1641* (MO, holotype).

Shrubs or small *trees,* the branchlets strongly ascending, often strict, terete, drying dark gray. *Leaves* ovate elliptic, 6–10 cm long, 3.0–4.5 cm wide, the costa slender, prominulous above, prominent beneath, the lateral veins 6–10, arcuate, yellow or yellow green when dry, prominent beneath, 0.7–2.0 cm apart, the smaller intermediate veins irregular, some strict, some reflexed, all soon evanescent, papyraceous to thinly coriaceous, densely villosulose beneath; petioles to 0.7 cm long, densely golden villosulose; stipules connate, the sheath short, 1–2 mm long, truncate, puberulent, each part with 2 scarcely divergent lateral awns, to 5 mm long. *Inflorescences* terminal, puberulent, the peduncles 3–4 cm long, rigid, terminated by 3 branches radially disposed, ca. 2 cm long, the branches often dilated toward the apex, the median branch more strict; lower bracts 2, divergent or scarcely reflexed, linear lanceolate, to 0.4 cm long, a single, few-flowered capitulum on each branch, the flowers ca. 10, to 1 cm long, wider than long, the outer bracts few, involucral in a single series, widely triangular, to 4 mm long, ca. 3 mm wide, lightly pubescent, the interior bracts narrower, few, ovate, in bud each flower enveloped by a pair of bracteoles. *Flowers* with the calycine tube campanulate, ca. 2.5 mm long, somewhat thick, puberulent, the lobes 5, ovate or triangular, to 0.8 mm long, obtuse or acute apically; corolla bud cream green, subfusiform but obtuse at the apex, white puberulent outside, to 20 mm long at anthesis, pilose within below the middle of the tube, subcarnose, the lobes 5, linear, ca. 8 mm long, ca. 0.8 mm wide, spreading, puberulent outside; stamens 5, linear oblong, ca. 3 mm long, ca. 0.35 mm wide, dorsifixed, the filaments slender, ca. 0.8 mm long, glabrous, attached ca. 8 mm from the base of the tube; style ca. 16 mm long, ca. 0.35 mm wide, the stigmas 2, erect, each ca. 2 mm long, subcrassate. *Fruits* sessile, oblong, to 1.8 cm long, glabrous, smooth, drying black, lightly costate.

Psychotria umbelliformis is known only from Panama.

BOCAS DEL TORO: Punta Pena, *Lewis et al. 2148* (COL, MO, UC, VEN). COCLÉ: Cerro Pilón, *Duke 12154* (MO). COLÓN: Santa Rita Ridge, *Dwyer & Lallathin 9018* (MO). Río Santa Isabel, Portobelo, *Lao 164* (MO). PANAMÁ: Cerro Trinidad, *Kirkbride & Duke 1641* (MO). Cerro Jefe, *Duke 8168, 15219* (both MO).

93. **Psychotria vallensis** Dwyer.[120] TYPE: Panama, *Dwyer 11867* (MO, holotype).

Shrubs 1½–3 m tall, flat topped, the twigs branching freely, smooth, puberulent to glabrescent, the nodes well spaced. *Leaves* oblong, ovate oblong, or obovate oblong, 2.5–6.5 cm long, 1.4–3.5 cm wide, rounded or obtuse toward the apex, acuminate, the acumen deltoid, to 1 cm long, often falcate, ultimately acute or obtuse, basally cuneate or the blade contracted basally and ultimately subauriculate, the costa plane to prominulous above, prominulous beneath, the lateral veins 7–10, arcuate, often with domatia in the vein beneath the axils, the smaller veins between lateral veins 1–2, soon disappearing, often marcescent when dry, the intervenal areas smooth, the ultimate venules inconspicuous, the margins often undulate; petioles to 3 mm long, turgid toward the base; stipules free, soon deciduous, ovate oblong, to 8 mm long, with 2 or occasionally only 1 subulate awn, glabrous, rubescent, shorter than the body. *Inflorescences* terminal, solitary, shorter than the leaves, the branches and the cymes few. *Flowers* with the hypanthium short, ca. 0.5 mm long, the calycine cup somewhat turgid, ca. 0.35 mm long, petaloid, glabrous or minutely puberulent, the interior glands small, few, the teeth 5, minute; corolla white, the tube cylindrical, ca. 2.5 mm long, glabrous outside, densely villose within near the mouth, the lobes 5, narrowly oblong, 1.3–2.2 mm long, thickly petaloid, slightly cucullate; stamens 5, exserted, oblong, 1.3 mm long, the filaments short; style 4 mm long, dilated above the middle, the stigmas small, subulate, ca. 0.5 mm long, the ovarian disc large, compressed rotund, ca. 0.85 mm long. *Fruits* rotund, 0.5 cm in diam., to 1 cm wide when flattened, orange or red, black when dry, glabrous; pedicels ca. 3 mm long, glabrate.

Psychotria vallensis is known only from Panama. It is remarkable as to habit, being flat topped as the branches spread horizontally.

COCLÉ: La Mesa above El Valle, ca. 2200 ft, *Dwyer 11867* (MO). El Valle, foot of Cerro Pilón, 2000 ft, *Dwyer & Correa 7983* (GH, MO, UC, US). Cerro Pilón, 800–1045 m, *Mori et al. 6551* (MO). PANAMÁ: Cerro Campana, trail to summit, 870–1000 m, *Mori & Kallunki 3543* (MO). NE of Cerro Azul, *Mori & Kallunki 3658* (MO). VERAGUAS: 6.4 km outside Santa Fe toward Cordillera, *Folsom 2980* (MO). NW of Santa Fe, 1.5 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5324* (MO). Cerro Tute, 750–1000 m, *Mori 6237* (MO).

94. **Psychotria veraguensis** Dwyer.[121] TYPE: Panama, *Croat 25871* (MO, holotype).

Shrubs to 1.25 m tall, the stems terete, ultimately angular or conspicuously plano compressed, black when dry, glabrescent or minutely puberulent, the nodes

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[120] *Psychotria vallensis* Dwyer, spec. nov. *Suffrutices* 1½–3 m alti ramulis in toto apice complanatis. *Folia* oblonga, ovato-oblonga, obovato-oblonga, 2.5–6.5 cm longa, 1.4–3.5 cm lata, apicem versus rotundata vel obtusa acumine ad 1 cm longo, venis lateralibus 7–10 chartacea marginibus in sicco saepe undulatibus; petiolis ad 3 mm longis; stipulis liberis ovato-oblongis, ad 8 mm longis setis 2 (1) subulatis glabris. *Inflorescentiae* terminales solitariae quam foliis breviores ramis cymisque paucis. *Flores* dentibus calycis minutis; corolla tubo ca. 2.5 mm longo, extus glabro; antheris ca. 1.3 mm longis. *Fructus* pedicellis ca. 3 mm longis, rotundi, ca. 0.5 cm in diam., aurantiaci vel rubri in sicco nigri, glabri.

[121] *Psychotria veraguensis* Dwyer, spec. nov. *Suffrutices* ad 1.25 m alti. *Folia* ovato-oblonga vel oblonga, 4–6 cm lata, apice lato-deltoidea vel acuta, venis lateralibus ca. 10, papyracea subtus argenteo-viridia laevia nitida glabra ad minuto-puberula; petiolis ad 1.5 cm longis; stipulis basi connatis parte utraque corpore brevissimo mox bifidis aristis erectis subulatis ad 1.5 cm longis, acutissimis,

well spaced. *Leaves* ovate oblong or oblong, 9–12 cm long, 4–6 cm wide, widely deltoid or acute apically, acuminate, the acumen narrowly triangular, to 1.5 cm long, often subfalcate, basally obtuse or widely cuneate, often abruptly contracted and inequilateral, the costa prominulous above and beneath, the lateral veins ca. 10, arcuate, without a conspicuous submarginal vein, the intervenal areas spreading reticulate, the smaller veins pinnatiform, papyraceous, often dark red above, dark silver green beneath, smooth, shiny, glabrous to minutely puberulent, the margins scarcely revolute; petioles to 1.5 mm long, to 0.18 cm wide, glabrous; stipules connate at the base, persistent, each part with a short body bifid and with 2 erect, subulate awns to 1.5 cm long, sharp, chartaceous, venose, glabrous. *Inflorescences* terminal, solitary, to 9 cm long, to 3 cm wide, the peduncle to 5 cm long, to 1.2 cm wide, the branches few, the lowermost branches 2 or 4, spreading, the flowers few; bracteoles minute, subulate. *Flowers* (in bud) sessile or subsessile; hypanthium and calycine cup to 0.5 cm long, glabrous, the teeth 5, triangular, to 0.1 mm long; corolla white, to 12 mm long, the tube glabrous outside, villose within, the lobes 5, short; stamens 5, the anthers oblong, to 1 mm long, the filaments short; style slender, to 1.5 mm long. *Fruits* (immature) sessile, oblong, to 3.5 mm long, obtuse, conspicuously costate.

Psychotria veraguensis is known only from the type collection. While the state of the inflorescence and infrutescence on this specimen leaves much to be desired, the vegetative parts, principally the persistent, rigidly awned stipules, are so distinct as to suggest a new species.

VERAGUAS: Road between Escuela Agricola Alto Piedra and Rio Dos Bocas, 530–620 m, *Croat 25871* (MO).

95. **Psychotria viridis** Ruiz & Pavón, Fl. Peruv. Chil. 2: 61. 1799. TYPE: not seen.

P. glomerata H.B.K., Nov. Gen. Sp. Pl. 3: 362. 1820. TYPE: Costa Rica, *Oersted 11610* (US, isotype).
P. microdesmia Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 36. 1852. TYPE: Costa Rica, *?Oersted*, not seen.
Uragoga glomerata (H.B.K.) Kuntze., Rev. Gen. 3: 299. 1891.
U. viridis (Ruiz & Pavón) Kuntze., Rev. Gen. 3: 301. 1891.

Small *trees* or *shrubs*, the twiglets slender, smooth, glabrous or puberulent, terete but ultimately angular, the nodes well spaced. *Leaves* elliptic, elliptic oblong or obovate oblong, often falcate, occasionally inequilateral, 6–14 cm long, 2.0–4.5 cm wide, acute to rounded or obtuse at the apex, acuminate, the acumen usually widely triangular, to 0.8 cm long, ultimately obtuse, usually attenuate acute at the base, the costa plane above, subprominent beneath, the lateral veins 7–10, arcuate, joining to form a vague, undulate submarginal vein to 2 mm from the margin, stiffly papyraceous, concolorous, usually drying brown, glabrate to minutely golden pubescent above and beneath; petioles 0.3–1.0 cm long; stipules free, oblong or ovate oblong, to 2 cm long, usually deltoid or conspicuously narrow toward the apex, stiffly scarious, ciliate, otherwise glabrate, usually mod-

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glabris. *Inflorescentiae* terminales ad 9 cm longae, ad 5 cm latae, pedunculo ad 5 cm longo, ramis paucis inferioribus binatis vel 4 patulis, cymis pauco-floris. *Flores* cupula calycis dentibus ad 0.1 mm longis, glabra; corolla ad 1.3 mm longa; antheris ad 1 mm longis. *Fructus* hic immaturi, oblongi, ad 3.5 mm longi, obtusi conspicue costati.

erately carinate, longitudinally venose. *Inflorescences* terminal, spreading, paniculate, usually shorter than the uppermost leaves; peduncles 2–3 cm long, angular, glabrate, the rachis zigzag, the branches few, usually opposite, the flowers disposed in well separated, few-flowered glomerules giving a spikelike appearance, the bracts caducous. *Flowers* sessile, minute; hypanthium short, rounded basally, puberulent, the calycine cup scarcely measurable, truncate, the teeth absent; corolla greenish white or white, the lobes 5, deltoid, apparently longer than the tube, to 1 mm long, densely white villose within; anthers subsessile, oblong, 0.35 mm long; ovarian disc compressed rotund, 0.6 mm long, the style ca. 0.4 mm long, conspicuously swollen above the middle, the stigmas ca. 0.15 mm long. *Fruits* sessile, oblong, 4–5 mm long, truncate at the apex, rounded at the base, drying dark, distinctly costate, glabrate, the calycine cup, if persistent, very short.

Psychotria viridis extends from Belize to Bolivia. It also occurs in Cuba.

DARIÉN: Peak between Río Balsa and Río Aretí, ca. 300 ft, *Duke 8745* (MO). Puerto St. Dorotea, *Dwyer 2218* (MO). PANAMÁ: Between Cerro Jefe and La Eneida, 2100–2900 ft, *Dwyer 8210* (MO). Panamerican Highway, E of Bayano Bridge, *Folsom 1388* (MO). Bayano Cuipo Forest, 34.6 km E of Bayano Bridge, *Folsom 3534* (MO). Road from El Llano to Cartí-Tupile near Continental Divide, 300–500 m, *Liesner 1280* (MO). El Llano-Cartí Road 16–18½ km by road N of Panamerican Highway, 400–450 m, *Nee & Tyson 10937* (MO); *Tyson & Nee 7318* (MO). Cerro Azul to Cerro Jefe, *Tyson et al. 4237* (MO). SAN BLAS: Trail E of Cangandí-Mandinga airport road, 2–5 mi E of Mandinga Airport, *Duke 14774* (MO). COLOMBIA: CHOCO: Between Río Curiche and Alto Curiche, *Duke 9581* (MO). Madurex Logging Camp, *Duke 9933* (MO). Between Río Nercua-Quebrada Barrial and Quebrada Ambrosio near Camp Curiche, 10–294 m, *Duke 11469* (MO). Río Salaqui, Hydro Camp, 1100 ft, *Duke 15777* (MO). Rain forest, hill N of Alto Curiche, 300 m, *Duke & Idrobo 11223* (NY).

96. **Psychotria wilburiana** Dwyer.[122] TYPE: Panama, *Croat 25745* (MO, holotype).

Subshrubs to 1.5 m tall, the nodes well spaced except toward the apex of the twiglets. *Leaves* elliptic or elliptic oblong, to 24 cm long, to 9.5 cm wide, deltoid toward the apex, acute at the base, often widely cuneate, the costa prominulous or subplane, to 1.2 mm wide, the lateral veins ca. 23, arcuate, the marginal vein undulate, ca. 3 mm from the margin, submembranous, concolorous, green when dry, minutely farinose punctate on both sides, the raphides often conspicuous; petioles 4–7 cm long, ca. 1.2 mm wide, contorted; stipules persisting toward the apex of the stem, free, strongly imbricate, appressed, oblong, to 2.5 cm long, to 2 cm wide, membranous, glabrous, the margin conspicuously fimbriate, the fimbriae somewhat subulate, to 0.6 cm long, often bifid. *Inflorescences* axillary, to 4.5 cm long, to 4.5 cm wide, the flowers densely crowded; bracts numerous, imbricate, oblong or ovate oblong, to 1 cm long, to 0.4 cm wide, obtuse or widely deltoid, black when dry, minutely puberulent. *Flowers* with the hypanthium 3 mm long, puberulent, the calycine cup to 0.3 mm long, puberulent, the teeth 6, triangularly oblong, often unequal, to 0.8 mm long, obtuse; corolla white, the

[122] *Psychotria wilburiana* Dwyer, spec. nov. *Frutices* ad 1.5 m alti. *Folia* elliptica vel elliptico-oblonga, ad 24 cm longa, ad 9.4 cm lata, apice deltoidea; venis lateralibus ca. 23, submembranacea utrinque minuto farinoso-punctata; petiolis 4–7 cm longis; stipulis persistentibus liberis oblongis, ad 2.5 cm longis, ad 2 cm latis, membranaceis saepe bifidis venosis glabris margine conspicue fimbriato fimbriis subulatis, ad 0.6 cm longis. *Inflorescentiae* axillares cymosae ad 4.5 cm longae, ad 4.5 cm latae floribus dense confertis. *Flores* lobis calycis 6 triangulari-oblongis, ad 0.8 mm longis; corolla tubo ca. 3.5 mm longo, lobis 5, ad 0.6 mm longis; antheris ca. 0.9 mm longis. *Fructus* sessiles oblongi, ad 3.5 mm longi, glabri costati.

tube cylindrical, 3.5 mm long, thinly carnose, puberulent outside, glabrous within, the lobes 5, triangular, to 0.6 mm long, obtuse, cucullate; stamens 5, the anthers narrowly oblong, 0.9 mm long, obtuse, the filaments shorter than the anthers, attached near the middle of the tube; ovarian disc cushionlike, to 0.5 mm long, the style short, to 1 mm long. *Fruits* sessile, oblong, to 3.5 mm long, to 2 mm wide, glabrous, conspicuously ribbed, the calyx persistent.

Psychotria wilburiana is known only from Panama. It is named in honor of Robert L. Wilbur who has contributed much to the study of the flora of Panama. The new species is distinguished by its large and marginally fimbriate stipules and its calyx which has 6 equal or unequal teeth.

VERAGUAS: Valley Río Dos Bocas, 11–13 km beyond Agricultural School at Santa Fé, 350–500 m, *Croat 25745* (MO).

97. **Psychotria xerococcoides** Dwyer.[123] TYPE: Panama, *Gentry et al. 16924* (MO, holotype).

Subshrubs to 1 m tall; stems slender, unbranched, glabrous, drying dark purple, the nodes well spaced. *Leaves* oblong lanceolate, 23–27 cm long, 6.0–7.5 cm wide, deltoid at the apex, acuminate, the acumen to 1 cm long, attenuate at the base, the costa prominulous beneath, to 1.5 mm wide proximally, the lateral veins ca. 15, arcuate, prominulous beneath, the intervenal areas smooth, the veinlets patulous reticulate, scarcely evident, especially beneath, the margin delicately revolute, chartaceous, concolorous, drying brown, glabrous above, puberulent on costa and some veins below; petioles to 7 cm long, slender, plano-compressed, to 1.5 mm wide; stipules persistent only at the tip of the stem, triangular, oblong or hemispherical, to 0.5 cm long, occasionally retuse?, glabrous, often with a triangular glandular swelling near the middle within. *Inflorescences* axillary, sessile or subsessile, the flowers densely congested into 1–3 rotund masses, to 1 cm in diam., the bracts narrowly oblong, concave, falcate and thickened toward the apex. *Flowers* sessile or subsessile, the flowers densely congested into 1–3 rotund masses, to 1 cm in diam., the bracts narrowly oblong, concave, falcate and thickened toward the apex. *Flowers* sessile or subsessile, the hypanthium slender, glabrous, the cup of the calyx scarcely measurable, the lobes 5(4–?), narrowly oblong, 3.0–3.5 mm long, petaloid, puberulent; corolla white, the tube cylindrical, to 4 mm long, rounded at the apex in the bud, glabrous outside, densely villose in the throat within, the lobes upright, appearing like erect fingers, narrowly oblong, to 1.2 mm long; stamens 5, the anthers subsessile, oblong, ca. 0.8 mm long, plump, attached near the mouth; style filamentous, ca. 5 mm long, ca. 0.1 mm wide, the stigmas linear, ca. 0.3 mm long, the ovarian disc ca. 0.3 mm long. *Fruits* oblong, to 2 mm long, terete in cross section, truncate, puberulent.

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[123] *Psychotria xerococcoides* Dwyer, spec. nov. *Suffrutices* ad 1 m alti sine ramis. *Folia* oblongo-lanceolata, 23–27 cm longa, 6.0–7.5 cm lata, ad apicem deltoidea, acumine ad 1 cm longo, venis lateralibus ca. 15; petiolis ad 7 cm longis; stipulis triangularibus oblongis vel rotundis, ad 0.5 cm longis, glabris saepe proxime medium intus tumore triangulari glanduloso praeditis. *Inflorescentiae* axillares sessiles vel subsessiles floribus in caespites 1–3 rotundos ad 1 cm in diam. dispositis. *Flores* hypanthio glabro lobis calycis 5(4–?), 3.0–3.5 mm longis; corolla tubo ad 4 mm longo, extus glabro intus villoso lobis ad 1.2 mm longis; antheris ad 0.8 mm longis, subsessiles. *Fructus* oblongi, ad 2 mm longi, puberuli.

Psychotria xerococcoides is known only from Panama but is to be expected in Colombia. It is named *P. xerococcoides* because of its overall resemblance to *Xerococcus congestus* Oerst. The tapering of the leaf blades basally and the subrotund axillary inflorescences are strikingly similar. *Psychotria xerococcoides* presumably has much smaller stipules than its counterpart. The critical factor in separating the two species is in the ovary, *Psychotria* having 2 ovules, *Xerococcus* having many.

DARIÉN: Cerro Tacarcuna massif between summit camp on westernmost ridge and Pico Tacarcuna, mostly elfin forest, 1650–1800 m, *Gentry et al. 16924* (MO).

68. RANDIA

Randia L., Sp. Pl. 1192. 1753; Gen Pl., ed. 5. 74. 1754. TYPE: *R. mitis* L. (=*R. aculeata* L.).

Basanacantha Hook. f. in Benth. & Hook. f., Gen. Pl. 2: 82. 1873. TYPE: not given.

Trees or shrubs, often with axillary or extra axillary spines; stipules imbricate and persistent at the apex of the branchlets, free or occasionally connate. *Inflorescences* axillary or lateral, corymbose, the flowers occasionally solitary. *Flowers* dioecious or bisexual, small to large, the hypanthium ovoid or obovoid, often truncate, the calycine cup tubular, cup shaped or campanulate, truncate, toothed or lobed, the lobes often foliaceous; corolla campanulate, funnelform or salver shaped, the tube glabrous or hairy within, the lobes (4–)5, occasionally more, contorted in bud; anthers usually 5, dorsifixed, included or exserted, inserted in the throat or at the mouth, the style clavate, entire or 2-lobed, the ovary usually 2-celled; seeds usually numerous, immersed in a pulp, compressed.

Randia occurs throughout the tropical areas of the world.

Literature:

Standley, P. 1934. Rubiales 64. *Randia*, North American Flora 32(3): 160–180.
Steyermark, J. 1972. *Randia in* The Botany of the Guayana Highland—Part IX. Mem. New York Bot. Gard. 23: 325–343.

a. Plants anisophyllous, leaf pairs unequal ---- 4. *R. gentryi*
aa. Plants not anisophyllous, leaf pairs equal.
  b. Plants not cauliflorous.
    c. Plants armed.
      d. Fruits at maturity 5–9 cm long.
        e. Fruits oblong, the persistent calycine lobes to 3.5 cm long; spines curved ---- 9. *R. pepoformis*
        ee. Fruits rotund, the persistent calycine lobes less than 2 cm long; spines straight.
          f. Leaves densely pilose beneath; petioles ca. 4 cm long; fruits velvety puberulent ---- 6. *R. lasiantha*
          ff. Leaves at most moderately pilose beneath; petioles to 2 cm long; fruits glabrous ---- 7. *R. megalocarpa*
      dd. Fruits at maturity less than 5 cm long.
        g. Plants with terminal portion of stem unbranched or with very short branches; flowers less than 1 cm long ---- 5. *R. karsteni*
        gg. Plants with terminal portion of stem conspicuously branched
          h. Flowers ca. 2 cm long; fruits 1.0–1.2 cm in diam. ---- 1. *R. aculeata* fo. *aculeata*

hh. Flowers 3.0–3.8 cm long; fruits 3.2–5.0 cm long ..... 2. *R. armata*
cc. Plants unarmed.
i. Flowers ca. 2 cm long ..... 1. *R. aculeata* fo. *mitis*
ii. Flowers 12–14(–20) cm long ..... 3. *R. formosa*
bb. Plants cauliflorous ..... 8. *R. mira*

1. **Randia aculeata** L., Sp. Pl., 1192. 1753. TYPE: not seen.

R. mitis L. Sp. Pl., 1192. 1753. TYPE: Jamaica, not seen.
R. latifolia Lam., Encycl. Méth. Bot. 3: 24. 1789. Based on plants "Dans les Antilles, à la Jamaique, & à la Vera-Cruz," not seen.
Mussaenda rotundifolia Sesse & Moc., Fl. Mex., ed. 2: 59. 1894. TYPE: not seen.

Shrubs or trees to 6 m tall, the branches well spaced, terete or 4-angled, usually distichous, the branchlets angular, stout, glabrous, short or long, 2–15 cm long, the bark drying dark, often cracking, usually with 2 stout subulate spines at the subterminal position or occasionally along branchlets, the spines bicornuate in appearance, spreading, (0.6–)1.0–2.0 cm long, lignose. *Leaves* polymorphic, broadly obovate-oblong, 1.0–5.5(–9.0) cm long, 0.8–3.2(–5.0) cm wide, variable in size on the same branch, rounded or obtuse at the apex, occasionally truncate, attenuate acute at the base, the costa prominulous above and beneath, the lateral veins 4–5, at first strict, then arcuate and anastomosing to form a submarginal undulate vein, the latter ca. 5 mm from the margin, the margin conspicuously emarginate, chartaceous to coriaceous, concolorous, glabrous, lustrous; petioles absent or to 1 mm long; stipules subtriangular, to 2.5 mm long, to 3 mm wide at base, apiculate. *Flowers* clustered at the apex of the twigs, perfect, sessile or subsessile, the hypanthium and calyx to 1 mm long, pubescent, the calycine teeth 5, erect, subulate, corolla white, the tube 4–8 mm long, cylindrical, the lobes 5, lanceolate, often longer than the tube, villose at the mouth within; stamens 5; the anthers oblong, ca. 4 mm long, included or exserted; style slender, the stigmas short. *Fruits* sessile, rotund, 1.0–1.2 cm in diam., glabrous or minutely puberulent, occasionally farinose, delicately ribbed.

Randia aculeata extends from Mexico to Colombia. It also occurs in the West Indies.

Two forms may be recognized in the species. In the collections cited specimens of forma *mitis* are indicated with an asterisk (*). "Iko nasi." Cuna (*Duke 14391*).

a. Plants armed ..... 1. *Randia aculeata* forma *aculeata*
aa. Plants unarmed ..... 2. *Randia aculeata* forma *mitis*

CANAL ZONE: Galena Point, *Blum & Dwyer 2139* (MO). Coco Solo, *Dwyer & Duke 7914* (GH, MO, US). Fort Sherman, *Hayden 105* (MO); *Lazor 5499* (MO). 1 mi NE of Pina, *Lewis et al. 1843* (GH, MO). Fort Sherman, from Pina to 3 mi NE of Pina, *Liesner 1377* (MO). Peluca Hydrographic Station and Quebrade Peluca along Rio Boqueron, *Steyermark & Allen 17244** (MO). CHIRIQUÍ: Cerro Galera Chorca, near Gualaca, *Allen 5058** (MO). Puerto Armuelles, *Busey 742* (MO). COCLÉ: El Valle, *Ebinger 1065* (MO). COLÓN: Vicinity of San Miguel de la Borda, *Croat 9868, 9995* (both MO). South end of Isla Grande, *D'Arcy 4022* (MO). Maria Chiquita, *Ebinger 443* (MO). Road to Portobelo between Rio Piedras and Portobelo, *Elias & Kirkbride 1641* (MO, UC). Rio Guanche, *Gentry 6317** (MO). 2–3 mi up Rio Guanche, *Kennedy & Foster 2165** (MO). Salud, *Lao & Holdridge 248* (MO). Rio Guanche, ca. 3 km upriver from bridge, road to Portobelo, *Mori & Kallunki 5920** (MO). 4½ km SW of Pina, *Nee 11683* (MO). DARIÉN: Puerto St. Dorotea near Cocolito, *Dwyer 2246* (MO). HERRERA: 4 mi S of Los Pozos, *Tyson 2650* (MO). PANAMÁ: Rio Terable near Panamerican Highway and El

Llano, *Duke 5676** (MO). Rio Bayano, 1–4 mi above Piria, *Duke 14391** (MO). SAN BLAS: Mulatuppu, *Duke 8547* (MO). Near Mandinga on mainland, *Duke 8872* (MO). Río Ailigandí, *Duke 10835* (MO). Río Cuadi, 6 air miles SW of Mulatuppu, *Duke 14216** (MO). Río Cuadi, Camp Diabolo (Drill Site 22), *Duke et al. 3614** (MO). Ailigandí, *Dwyer 6807* (MO). Island of Suskatupu, *Kirkbride 177* (MO). Mainland opposite Achituppu, *Lewis et al. 109* (GH, K, MO, UC, US). VERAGUAS: Santiago, 12 mi from Santiago toward Divisa, *Dwyer & Kirkbride 7435* (MO, UC). Ensenada Santa Cruz, Coiba Island, *Foster 1649* (MO). Mouth Río Concepcion, *Lewis et al. 2796* (MO, UC).

2. **Randia armata**[124] (Swartz) DC., Prodr. 4: 387. 1830.

Gardenia armata Swartz Prodr. Fl. Ind. Occ. 51. 1788. TYPE: not seen.
Mussaenda spinosa Jacq., Sel. Stirp. Amer. 70. 1763. TYPE: Colombia, *Jacquin*, not seen.
Randia spinosa (Jacq.) Karst. Fl. Colomb. 2: 128. 1869.
R. panamensis Standley, Field Mus. Nat. Hist., Bot. Ser. 4: 288. 1929. TYPE: *Cooper 213* (F, holotype; NY, isotype).

Trees to 10 m tall, the branchlets terete or angular, usually opposite, stiff and spreading, subequal, armed terminally or subterminally, the spines 2–4, to 1.8 cm long, thin or relatively stout. *Leaves* oblong, obovate oblong or oblong rotund, 3–17(–30) cm long, 4.2–5.0(–13.0) cm wide, tapering obtusely at the apex, the acumen to 2 cm long, usually vaguely falcate, acute, obtuse and slightly inequilateral at base, the costa prominulous, plane or immersed above, prominent beneath, the lateral veins (5–)6–8(–10), at first strict, then arcuate, the smaller veins perpendicular, irregularly spreading, chartaceous to papyraceous, concolorous, glabrous above, minutely puberulent on the costa and the veins beneath, occasionally barbate in axils or occasionally hairs restricted to the costa. *Flowers* terminal, solitary, 3.0–3.8 cm long, the hypanthium oblong, ca. 1.5 mm long, the calycine cup ca. 1.5 mm long, petaloid, glabrous and eglandular within, glabrate outside, the calycine teeth 5–6, oblong lanceolate, 4–5 mm long, 2.0–2.2 mm wide, subequal, acute, glabrous except minutely puberulent marginally; corolla white or yellowish, the tube narrow-cylindrical, ca. 25 mm long, ca. 3.5 mm wide in middle, glabrous inside and out, the lobes 5, imbricate, oblong, ca. 5 mm long, obtuse, glabrous; stamens 5, oblong, ca. 5 mm long, ca. 1.8 mm wide, obtuse, versatile, the filaments short, attached near the mouth; stigmas 2, erect, ca. 3 mm long, ca. 2 mm wide, the style linear, as long as the corolla tube, ca. 0.4 mm wide in the middle. *Fruits* rotund to compressed rotund, 2.3–5.0 cm long, smooth, usually delicately ribbed, glabrous, often minutely lenticellate, the persistent calyx tubular, to 1 cm long.

Randia armata ranges from Baja California through Mexico and Central America to South America. It also occurs in the Lesser Antilles. "Jagua Macho," "Miel Quema."

BOCAS DEL TORO: Almirante, *Cooper 213* (F); *Cooper & Slater 66* (US). Duwebdulyp Peak, N of Río Terebe across from Quebrada Huron, *Kirkbride & Duke 561* (MO). Fish Creek Mts., *Wedel 2342* (MO, US). CANAL ZONE: Madden Dam, *Dwyer & Elias 7479* (GH, MO, US). Madden Forest, *Gentry 1807* (MO). Hills SW of Gatún, *Johnston 1583* (MO). BARRO COLORADO ISLAND: *Bailey & Bailey 474* (F); *Bangham 559* (F); *Croat 4034, 4920, 7378, 9131, 10104, 15589* (all MO); *Dwyer 1408* (MO); *Ebinger 238, 566* (both MO); *Hladik 360* (US); *Kenoyer 558* (US); *Knight 371* (MO); *Oppenheimer 66-8-29-1801* (MO); *Zetek 3551* (MO). COCLÉ: El Valle, *Allen 1789* (MO, US); *Ebinger 1065* (MO). Rivera sawmill, Alto Calvario, 600–800 m, *Folsom 3176* (MO). COLÓN: Santa Rita Ridge, ca. 5.5–6 mi E of Transisthmian Highway, *Lewis et al. 5384* (MO, SCZ, UC). DARIÉN: Rio Uruceca, *Bristan 1436* (MO). Hills near Pidiaque, *Duke 8045* (MO). Without other locality, *Duke 8340* (MO).

[124] For more complete synonymy see Steyermark (1972) and Standley (1934).

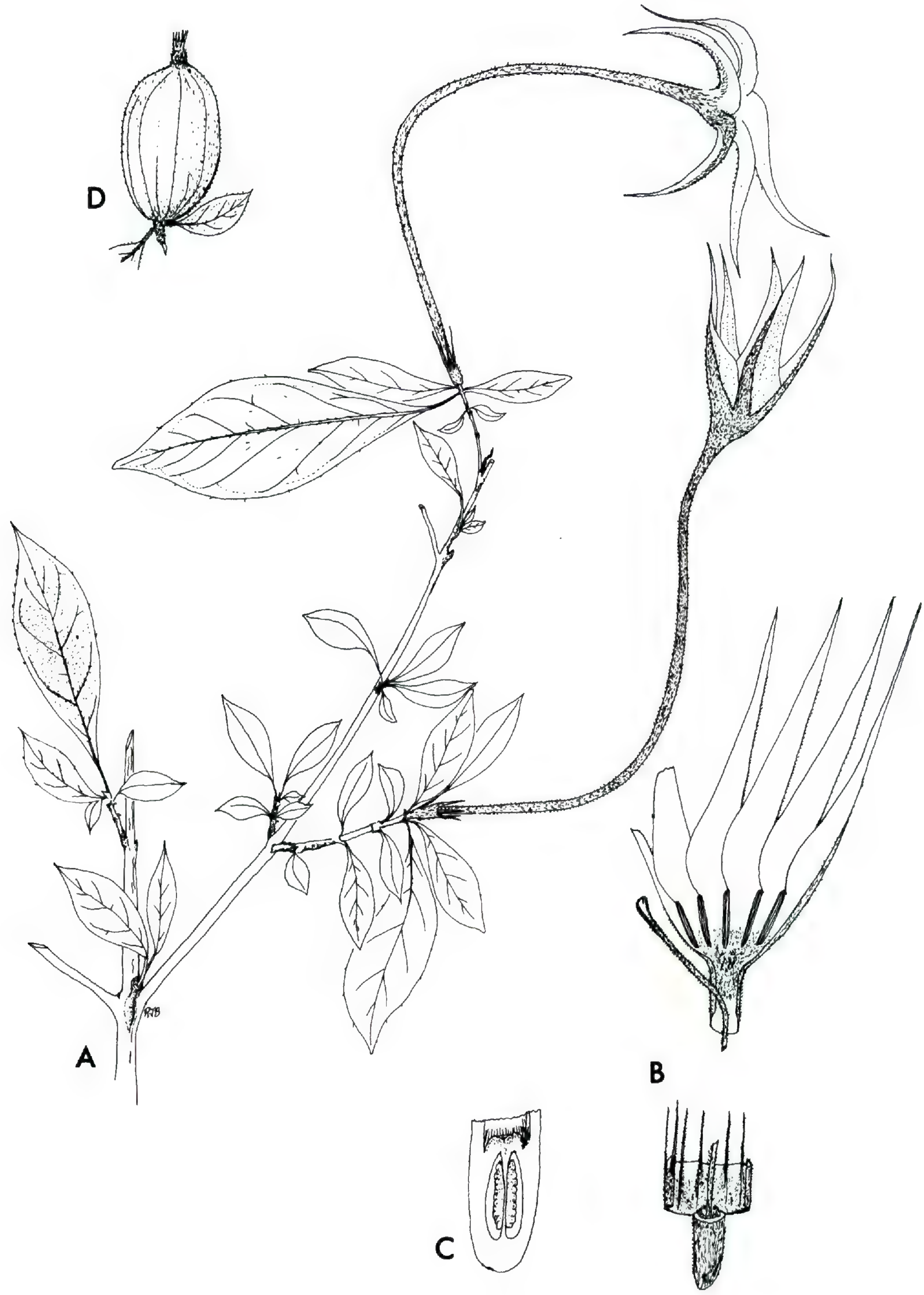

FIGURE 81. *Randia formosa* (Jacq.) Schum.—A. Habit (×½).—Flower exploded to show interior (×1½).—C. Ovary longitudinal section (×2). [After *Duke 5387.*]—D. Fruit (×½). [After *Gentry 6464.*]

Cerro Campamento, S of Cerro Pirre, *Duke 15702* (MO). Yaviza, *Duke & Bristan 430* (MO). Río Pirre, *Duke & Bristan 8287* (MO). Cerro Pirre, 2500–4000 ft, *Duke & Elias 13697* (COL, MO, UC, VEN); *Gentry 4597* (MO). Between Tres Bocas and Cerro Campamiento, Cuasí-Cana Trail, *Kirkbride & Duke 1354* (MO). N slope of Cerro Pirre, 300–700 m, *Mori & Kallunki 5390* (MO). Camp Summit, Darién-San Blas Border, Sea Level Canal Route 17, 1000–1200 ft, *Oliver et al. 3698* (MO). LOS SANTOS: 11 mi N of Tonosi, *Tyson et al. 2974* (MO). PANAMÁ: Río Pacora, E of Panama City, *Bartlett & Lasser 16972* (MO). Confluence of Río Pacora and Río Corso, *Duke 11979* (MO). Rio Sancanti, ca. 2 mi upstream from Piria, *Duke 14361* (MO). Beyond Cerro Jefe, 2100–3000 ft, *Duke & Dwyer 15068* (MO). Banks of Río Ipeti, near Panamerican Highway, *Folsom & Collins 1674* (MO). Stream flowing out of Serrania de Majé, *Folsom & Collins 1716* (MO). Cerro Trinidad, Saddle on SE slope, *Kirkbride & Duke 1662* (MO). Taboga Island, *McBryde 409* (US). Alhajuela, *Pittier 3447* (US). Taboga Island, *Pittier 3606* (US). Río Tocumen, *Standley 26740, 29332* (both US). Taboga Island, *Standley 27048, 27903* (both US). Nuevo San Francisco, *Standley 30709* (US). SAN BLAS: Perme, *Cooper 251* (US). Headwaters of Rio Mulatupo, *Elias 1765* (MO, UC). El Llano-Cartí Road, 24.5–25.0 km from Interamerican Highway, *Mori & Kallunki 5528* (MO).

3. **Randia formosa** (Jacq.) Schum., Mart. Fl. Bras. 6(6): 342. 1889.—FIG. 81.

Mussaenda formosa Jacq., Enum. Pl. Carib. 16. 1760. TYPE: Colombia, *Jacquin*, not seen.
Gardenia mussaenda L.f., Suppl. 163. 1781. TYPE: not seen.
Randia mussaenda (L.f.) DC., Prodr. 4: 388. 1830.
Gardenia maritima Vahl in DC., Prodr. 4: 388. 1830. TYPE: not seen.

Shrubs to 5 m tall, the branches 8.5–20.0 cm long, terete, unarmed, opposite, stiff, strongly ascending, usually glabrous, occasionally pubescent, the nodes crowded terminally, otherwise well spaced. *Leaves* ovate trapeziform, obovate-oblong, or lanceolate, occasionally inequilateral or subfalcate, 2–10 cm long, 1.3–4.0 cm wide, deltoid, rounded or acute apically, rounded or obtuse at the base, the costa slender, prominulous to plane above, prominulous to prominent beneath, the lateral veins 5–6, arcuate, chartaceous, concolorous, glabrate but often villosulose on costa and veins; petioles 0.3–1.2 cm long; stipules ovate triangular, to 2.5 mm long, acute, drying rubescent, often venose, scarious, marginate. *Flowers* solitary, terminal, sessile, 12–14(–20) cm long, the hypanthium ca. 12 mm long, the calycine cup cylindrical, 6–7 mm long, 4.5–5.0 mm wide, silky pubescent, the lobes 4–5, linear, 4.5–8.0 mm long; corolla with the tube to 19 cm long, sericeous strigose outside, papillose and velutinous within above the middle, the lobes narrowly triangular, 5–6 cm long, acute, glabrous, pubescent abaxially; stamens 5, the anthers oblong, 5 mm long, attached at the mouth; style slender with ascending hairs above middle, the stigmas broadly 2-lobed. *Fruits* sessile, oblong or rotund, 1.5–2.5 cm long, occasionally wider than long, usually drying black, glabrate to sparsely hairy, the seeds numerous, plane, disposed 4-seriately.

Randia formosa ranges from Panama to Peru and Brazil. It also occurs in the Antilles.

CANAL ZONE: Juan Mina, *Bartlett & Lasser 16542* (MO). Old Gamboa Road between Summit Hills Golf Course and Summit Naval Radio Station, *Croat 16669* (MO). 5 mi N of Gamboa Gate, *D'Arcy & D'Arcy 6010* (MO). Fort Kobbe, *Duke 4202, 4726* (both MO). Río Chagres, 1 mi above Madden Lake, *Duke 4455* (MO). Farfan Beach, *Dwyer 6761* (MO). C-15 Road, *Dwyer & Blum 2675* (MO). Albrook, *Hayden 64* (MO). Madden Dam, *Kirkbride & Elias 265* (MO). Summit, *Lindsay 251* (US). Base of Cerro Pelado, NW of Gamboa, *Nee 9269* (MO). Upper Chilibre River, *Seibert 150* (MO, US). Obispo, *Standley 31746* (US). Chiva-Chiva Trail, Miraflores Lake, *Tyson 1344* (MO). Miraflores Lake, *White 149* (MO). BARRO COLORADO ISLAND: *Aviles X-31* (MO); *Croat 11296, 11888* (both MO); *Foster 949* (MO); *Kenoyer 655* (US); *Shattuck 1100* (MO). CHIRIQUÍ: Rabo do Puerco, 8 km W of Puerto Armuelles, *Croat 21943* (MO). COLÓN: Santa Rita Ridge Road, 300–500 m, *Gentry 6588* (MO). Río Viejo and Río Ruiz, Portobelo Road, 4 km NE of Puerto Pilón, *Nee 7179* (MO).

DARIÉN: Quebrado Venado and Peje Swamp, headwaters of Rio Tuqueza, *Bristan 1025* (MO). Quebrada Aguacate, *Bristan 1212* (MO). Río Tuira between Pucro and Río Punusa, *Duke 5387* (MO). Isla Pedro Gonzales, *Duke 10394* (MO). Piria-Canazas Trail near Piria, *Duke 14311* (MO). 1–3 mi N of Paya, *Duke & Kirkbride 14006* (MO). Slopes of Cerro Pirre, 500–1000 m, *Gentry & Clewell 7128* (MO). PANAMÁ: Nuevo Emperador cerca de Arrazona, *Blandon 25* (MO). Panamerican Highway halfway between El Llano and Río Mamoni, *Duke 5538* (MO). Between Pacora and Chepo, *Gallardo 20* (MO). 4 mi W of Chepo, *Gentry 5556* (MO). Natural Bridge, Panama City, *Gentry 5611* (MO). Taboga Island, *Gentry 5722* (MO). 1 km E of El Llano, *Gentry 6464* (MO). Chepo, *Pittier 4447* (US). Matias Hernandez, *Standley 32062* (US). W of El Llano, road to Jesus Maria, *Tyson 6858* (MO).

4. **Randia gentryi** Dwyer.[125] TYPE: Panama, *Gentry & Mori 13629* (MO, holotype).

Small *trees* to 5 m tall, the branches lignose, glabrous, the nodes well spaced. *Leaves* conspicuously anisophyllous, elliptic, oblong or obovate oblong, 8–23 cm long, 3–7 cm wide, the smaller leaves often ovate, 1–4 cm long, acute, deltoid or occasionally rounded at the apex, acuminate, the acumen to 1.5 cm long, acute toward the base, the costa prominulous above and beneath, the lateral veins 9–12, arcuate, immersed, the undulate submarginal vein not visible or inconspicuous, coriaceous, scarcely discolorous, brown when dry, glabrous. *Inflorescences* axillary, the peduncle much reduced, to 0.5 cm long, the flowers solitary, the bracts crowded, imbricate, resembling the stipules. *Flowers* subsessile, the pedicels to 3 mm long; hypanthium oblong, ca. 4 mm long, glabrous except for numerous minute red glands, the calycine cup elongate cupuliform, ca. 5 mm long, turgid, truncate, glabrous with numerous minute red glands outside and similar to those of the hypanthium, to 0.6 mm wide, carnose but marginally thin, the teeth 5, subulate, slightly unequal, 2.5–3.3 mm long; corolla white, the tube narrowly cylindrical, ca. 2 cm long, glabrous, thickly carnose, the lobes 5, strongly imbricate, ovate elliptic or oblong, at first concave, ca. 2 cm long, acute, glabrous; stamens 5, the anthers sessile, oblong, ca. 7.5 mm long, acuminate at the apex, the acumen to 0.5 mm long, affixed near the middle of the tube; ovarian disc compressed cushion shaped, to 1 mm long, ca. 1.5 mm wide, the style ca. 12 mm long, ca. 3 mm wide; ovary unilocular, provided with 2 T-shaped parietal placentas closely appressed to the wall. *Fruit* oblong rotund, to 3.5 cm long, to 3 cm wide, glabrous, delicately ribbed, the persistent calyx ca. 0.35 cm long.

Randia gentryi is known only from Panama and from Colombia. It is readily recognized by its anisophyllous leaves. The glands studding the hypanthium and the calycine cup are diagnostic. The species is named in honor of Alwyn Howard Gentry, who has contributed much to our knowledge of the flora of the New World tropics. The collectors note that the tree has "myristicaceous branching."

DARIÉN: Top of Cerro Mali, lower montane wet forest, 1300–1420 m, *Gentry & Mori 13629* (MO). COLOMBIA: CHOCO: Serrania del Darién, W of Unguia, near Panama border, *Gentry et al. 17022* (MO).

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[125] *Randia gentryi* Dwyer, spec. nov. *Arbores* parvae ad 5 m altae. *Folia* anisophylla, elliptica, 8–23 cm longa, 3–7 cm lata (foliis minimis plerumque ovatis, 1–4 cm longis), venis lateralibus 9–12, coriacea, glabra. *Flores* solitariae in axillis subsessiles; hypanthio ca. 4 mm longo cupula calycis ca. 5 mm longa, turgida truncata glabra extus intusque glandulis crebris minutis ca. 0.6 mm latis praedita; corolla tubo ca. 2 cm longo, lobis ca. 2 cm longis; antheris ca. 7.5 mm longis. *Fructus* oblongo-rotundi, ca. 3.5 cm longi, calyce minuto.

5. **Randia karstenii** Polak., Linnaea 41: 568. 1877. TYPE: Costa Rica, *Polakowsky 74, 302*.

Small *trees* to 10–15 ft tall, the twigs apparently unbranched or with short, opposite, distichous branches, these angular, rimose, glabrous, armed, the spines paired, terminal as well as along the length of the twig, opposite, angular ascending, to 2 cm long, to 0.2 cm wide. *Leaves* elliptic oblong, obovate oblong or rhombic oblong, to 4 cm long, to 2 cm wide, obtuse to widely deltoid at the apex, usually minutely apiculate, basally attenuate to attenuate cuneate, the costa prominulous above and beneath, the lateral veins 5–6, arcuate, joining to form a submarginal vein 3 mm from the margin, stiffly membranous, concolorous, glabrous but minutely ciliolate; petioles slender, often curved, to 1 cm long. *Inflorescences* and *flowers* not seen. *Fruits* sessile, rotund, to 1 cm in diam., puberulent, lightly ribbed, the calyx to 1.1 cm long.

Randia karstenii occurs in Costa Rica and Panama. The single poor collection from Panama matches the Costa Rican material annotated by Standley.

Standley (1934) describes the flowers and fruits as: "flowers perfect, terminal, solitary, sessile; calyx and hypanthium 2–3 mm long, glabrous, the lobes linear or oblanceolate; corolla white, 6 mm long, glabrous outside, the throat naked, the lobes broadly ovate, short acuminate; fruit globose, usually 1 cm in diam., but sometimes as much as 2.5 cm." He adds that the plant reaches 7.5 m in height with a trunk 25 cm in diam.

Dissecting a flower of a Costa Rican collection, *Jiménez 3940* (F), I found that it matches Standley's description except that there were conspicuous hairs at the throat.

CHIRIQUÍ: Boquete, *Davidson 832* (F).

6. **Randia lasiantha** (Standley) Standley, Contr. U.S. Natl. Herb. 20: 201. 1919.

Basanacantha lasiantha Standley, Contr. U.S. Natl. Herb. 18: 134. 1916. TYPE: Panama, *Pittier 3473* (US, holotype).

Trees to 9 m tall, the branchlets terete, glabrous, ultimately rugulose and knotty, lenticellate, the nodes proximate, armed, the spines thickly subulate, to 0.8 cm long, the leaf scars usually obvious only at the tips of the twigs, compressed rotund to rotund. *Leaves* tending to persist at the ends of the twiglets in rosettes, elliptic oblong, oblong to oblong rotund, 8.5–10.0(–15.0) cm long, 2–5(–10) cm wide, acute to occasionally rounded at the apex, occasionally vaguely acuminate, cuneate or obtuse at the base, the costa prominulous above and beneath, the lateral veins 11–13, strongly arcuate ascending, scabrous and hirtellous above, densely pilose beneath, the hairs short, white, chartaceous, discolorous or concolorous; petioles to 4 cm long; stipules crowded at the apex of the twiglets, imbricate, glumaceous, ovate oblong, to 1 cm long, obtuse, glabrous outside, ciliate, lined with elongate, weak, and appressed hairs within, the hairs to 2 mm long. *Flowers* sessile, 1–3 at the tips of the branchlets, the hypanthium short, the calycine cup cylindrical or subcampanulate, to 1.5 cm long, 0.6–0.8 cm wide, densely sericeous outside, densely appressed villose within, truncate, the calycine teeth linear, to 7 mm long, erect, well spaced, villose; corolla white, the tube to

5.5 cm long or perhaps longer, narrowly cylindrical, ca. 6 mm wide at the apex, densely silvery sericeous outside, sparsely pilose within, the lobes 5, narrowly ovate lanceolate, to 4.5 cm long, attenuate and acute, sericeous outside, glabrous on the margins, glabrous within; anthers ca. 1 cm long; ovarian disc barrel shaped, 1.25–1.75 mm long, 0.5–0.7 mm wide, villose. *Fruits* sessile, rotund, to 7 cm in diam., smooth, velvety puberulent outside, the wall thick and woody, to 0.5 cm thick; seeds plano compressed, to 1 cm long, amber colored, embedded in a gelatinous white pulp.

Randia lasiantha is known only from Panama. *Croat* (*34687*) notes that the flowers fall in early morning.

CANAL ZONE: Woods near bridge, Madden Dam, *Correa & Dressler 273, 355* (MO). Madden Dam, Boy Scout Camp Road, *Dwyer & Elias 7508* (MO). Madden Dam, *Ebinger 883* (MO). Madden Dam, dirt road near parking lot, *Kirkbride & Elias 266* (MO). Boy Scout Road, Madden Dam area, *Porter et al. 4055* (MO). PANAMÁ: Río Majé 4–5 mi above waterfalls near new Bayano Lake, 100 m, *Croat 34687* (MO). Natural Bridge, Panama City, *Gentry 5611* (MO). Alhajuela, *Pittier 3473* (US).

7. **Randia megalocarpa** Dwyer.[126] TYPE: Panama, *Nee 8865* (MO, holotype).

Shrubs to 5 m tall, the branches stout, distichous, terete, lignose, the pith scarcely evident, the bark thin, smooth but drying dull greyish, the spines paired at or near the branch tips, less than 1 cm long. *Leaves* oblong or oblong rotund, 10–17 cm long, 4–10 cm wide, rounded or obtuse at the apex, widely cuneate at the base, stiffly chartaceous, concolorous, drying yellow green, the costa slender, prominulous or immersed, prominent beneath especially proximally, the lateral veins ca. 10, strongly ascending, strict with well spaced smaller veins between a pair of lateral veins, prominulous, these arising arcuately from each lateral vein above with numerous, white, stiff, erect hairs, to 0.2 mm long, the surface somewhat rough to the touch, the hairs beneath densely softer and longer, to 1 mm long; petioles slender or stout, to 2 cm long, puberulent; stipules not seen. *Flowers* not seen. *Fruits* large, rotund, to 6 cm in diam., green or brown, smooth, glabrous, minutely rugulose, the wall lignose on drying, to 0.8 cm thick, with a conspicuous mammiform persistent calycine cup to 0.5 cm long; seeds numerous, plano compressed, oblong or oblong rotund, to 1 cm long, smooth, glabrous, drying orange, disposed in longitudinal rows, the seeds perpendicular to the fruit axis, embedded in a gelatinous pulp, dark brown.

Randia megalocarpa is known only from Panama. The fruits are the largest among the Panamanian *Randia* except for *R. lasiantha*. Michael Nee, the collector, notes the "fruit green or brownish; seeds to light brown in darker brown rummy-smelling pulp."

PANAMA: Vicinity of television tower on Continental Divide, Cerro Penon, 350–440 m, 3 km S of Alcalde Diaz; tropical moist forest, *Nee 8865* (MO).

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[126] *Randia megalocarpa* Dwyer, spec. nov. *Frutices* ad 5 m alti, ramulis crassis lignosis armatis. *Folia* oblonga vel oblongo-rotunda, 10–17 cm longa, 4–10 cm lata, venis lateralibus ca. 10 rigido-chartacea, supra scabrella ciliis rigidis brevibus subtus dense villosa; petiolis ad 2 cm longis. *Flores* non visi. *Fructus* baccati rotundi, ad 6 cm in diam., laeves glabri pariete valde crasso; seminibus multis plano-compressis, oblongis vel oblongo-rotundis, ad 1 cm longis, laevibus horizontalibus 8-seriatim dispositis pulpa gelatina inclusis.

8. **Randia mira** Dwyer.[127] TYPE: Panama, *Mori & Kallunki 4953* (MO, holotype).

Trees to 6 m tall, the branchlets terete, the bark thin, red, deciduous, the nodes ultimately crowded. *Leaves* oblong, to 28 cm long, to 12.5 cm wide, deltoid to subobtuse at the apex, cuneate and slightly inequilateral at the base, the costa subplane above, somewhat convex beneath, to 2.5 mm wide, the lateral veins ca. 15, at first departing from the costa strictly, arcuate near the margin, the submarginal undulate vein conspicuous and forming 5–10 smaller irregular-pinnatiform veins, coriaceous, concolorous, smooth, glabrous above, glabrate beneath, short, appressed hairs confined to the costa and nerves; petioles to 1 cm long, lignose; stipules connate, compressed-rotund, to 0.6 cm long, with a median subulate awn to 0.6 cm long, puberulent outside. *Plants* cauliflorous, the flowers solitary but a few scattered on a twig, presumably regularly epedicellate; bracteoles several, imbricate at the base of the hypanthium, triangular, to 8 mm long, to 5.5 mm wide, acute, the apex rigid and thick, truncate at the base, the margins thin, the body fleshy with a few white silken hairs outside, within the hairs appressed, upright, weak, glandular at base, to 1 mm long. *Flowers* with the hypanthium short, to 3 mm long, puberulent, the calycine cup widely cylindrical, to 1.8 cm long, turgid, often spathaceous in the upper portion, puberulent, the teeth 5–8, subulate, shorter than the cup, arising as a longitudinal thickening of the upper portion of the cup, often disposed on 1 side of the cup, the latter carnose, glabrous, smooth, with small white glands inside, the rim produced as a petaloid margin, minutely fimbriate; corolla yellow green outside, white inside, the tube narrowly cylindrical, to 8 cm long, ca. 0.4 cm wide in the middle, dilated toward the apex, puberulent outside, drying black, the lobes 5–6, imbricate, lanceolate, somewhat falcate, to 7 cm long, to 1.2 cm wide, acute, yellow green outside; anthers 6, sessile, oblong, ca. 2.5 mm long, minutely apiculate, attached ca. 6.5 mm above the base of the tube; style slender, somewhat compressed, ca. 6 mm long, the hairs white, appressed, the stigmas 2, erect, scarcely wider than the style, ca. 2 mm long, obtuse, the ovary 2-celled, the wall and septum thick, the ovules numerous, attached to the septum. *Fruits* not seen.

Randia mira is known only from Panama and according to the collectors is spectacular in the field. I have placed it in *Randia* despite the fact that it shows every indication of being a new genus. The absence of fruit is disconcerting. Its affinities with *Randia* are suggested by the flowers being solitary, by the imbricate bracts which subtend the flowers, and by certain structural features of the flowers, principally the large imbricate lobes of the corolla and the erect subulate calycine teeth. The fact that the floral whorls often depart from the 5-merous condition is confirmatory. Arguing against it being a *Randia* is the cauliflorous condition and

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[127] *Randia mira* Dwyer, spec. nov. *Arbores* ad 6 m altae. *Folia* oblonga, to 28 cm longa, ad 12.5 cm lata, venis lateralibus ca. 15, coriacea concoloria laevia supra glabra infra glabrescentia; petiolis ad 1 cm longis; stipulis fortasse vix connatis compresso-rotundis, ad 0.6 cm longis arista media ad 0.6 cm longa. *Plantae* cauliflorae, bracteis crebris confertis imbricatis. *Flores* solitariae; cupula calycis ad 1.8 cm longa turgida in parte superiore saepe spathacea, dentibus 5–7(–8), intus glandulis ornata, apice truncata dentibus minutis munita; corolla tubo ad 8 cm longo, lobis 5–6 imbricatis, ad 7 cm longis, acutis; staminibus sessilibus, antheris oblongis ad 2.5 mm longis; ovario bilocellato, ovulis crebris minutis. *Fructus* non visi.

the often spathaceous calycine cup whose truncate and strikingly thin lip bears minute interdental processes.

PANAMÁ: El Lano-Carti Highway, 17–20 km N of El Llano, *Dressler 4626* (MO). 5–10 km NE of Altos de Pacora at end of road; premontane rain forest, *Mori & Kallunki 4953* (MO).

9. **Randia pepoformis** Dwyer.[128] TYPE: Panama, *Gentry & Mori 13614* (MO, holotype).

Climbing, woody *plants*, the branches terete or angular, glabrous, armed, the spines solitary, thick, woody, to 2 cm long, to 0.3 cm wide at the base, curved, the nodes relatively well spaced, the scars of the terminal buds slender, ringlike, crowded, the leaf scars hemispherical to elongate-hemispherical, to 0.8 cm long. *Leaves* oblong or obovate oblong, 11–24 cm long, 5.0–12.5 cm wide, rounded toward the apex, widely cuneate basally, the costa prominulous above, prominent beneath, the lateral veins ca. 7, arcuate, the undulate submarginal vein close to the margin, thinly coriaceous, concolorous, glabrous, lightly revolute; petioles rigid, ca. 2 cm long; stipules not seen. *Inflorescences* and *flowers* not seen. *Fruits* pedicellate, the pedicels to 3 cm long, lignose, oblong, 7–9 cm long, terete, 3.0–4.5 cm wide, glabrous, conspicuously lenticellate, often with 10 prominulous or evanescent ridges, black, glabrous when dry, smooth, the calycine cup if persistent, cylindrical, 2–4 mm long, the calycine lobes 5, equal, oblanceolate, to 3.5 cm long, 1.0–1.5 cm wide, thinly coriaceous, glabrous, the veins 5 arising from the base, flabellately disposed; seeds horizontally disposed in 2 (or 4) rows.

Randia pepoformis is known only from Panama but it is likely to occur in the Dept. Choco, Colombia. Gentry and Mori indicate that their collection is a vine, while Folsom & Collins describe the plant as "a liana . . . trunk 1" diam." Duke, on the other Panamanian collection, makes no comment as to the habit of the plant. It is probably related to *R. calycosa* Standley, which according to Standley has foliaceous calyx lobes to 9 mm wide. *Randia calycosa* is, however, an unarmed tree with small leaves.

DARIÉN: Cativo swamp 5 mi downstream from El Real, *Duke 4905* (MO). Trail from Tacarcuna Village on Rio Tacarcuna to Cerro Mali, 800–1300 m, premontane wet forest, *Gentry & Mori 13614* (MO). PANAMÁ: 14 km N of Panamerican Highway, El Llano to Carti Road, *Folsom & Collins 1526* (MO).

69. RARITEBE

Raritebe Wernham, J. Bot. 55: 336. 1917. TYPE: *R. palicoureoides* Wernham.

Dukea Dwyer, Ann. Missouri Bot. Gard. 53: 262. 1966. TYPE: *D. panamensis* Dwyer.

Small *trees* or shrubs. *Leaves* lanceolate, acuminate; stipules subulate to triangular, often persistent. *Inflorescences* terminal, corymbose paniculate;

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[128] *Randia pepoformis* Dwyer, spec. nov. *Plantae* scandentes lignosae ramulis armatis spinis ad 2 cm longis. *Folia* oblonga vel obovato-oblonga, ad 24 cm longa, ad 12.5 cm lata, apicem versus rotundata venis lateralibus ca. 7 arcuatis, tenui-coriacea glabra; petiolis ca. 2 cm longis. *Inflorescentiae* et *flores* non visae. *Fructi* pedicellis ad 3 cm longis, lignosis, oblongi, ad 9 cm longi teretes, ad 4.5 cm lati, glabri, cupula calycis 2–4 mm longa, lobis oblongo-lanceolatis, ad 3.5 cm longis, 1.0–1.5 cm latis.

bracts subulate, tending to persist, the bracteoles affixed to the base of the pedicels. *Flowers* with the hypanthium short, the calycine cup reduced, the teeth 4–5; corolla with the tube narrowly cylindrical, the lobes valvate, shorter than the tube, reflexed and contorted after anthesis; stamens 4–5, the anthers narrow, the filaments short, affixed to the base of the tube; ovary 2-celled (or rarely 1-celled), the placentas adnate peltately to the median septum, or when uniloculate each placenta arising from the base of the ovary and then splitting, the ovules numerous. *Fruits* coccoid and baccate, small; seeds numerous, rotund, foveolate.

Kirkbride (1979) placed all Panamanian elements of this genus in *Raritebe palicoureoides* ssp. *dwyerianum* Kirkbr., but a number of distinctive groups are recognizable as species.

Raritebe occurs in Costa Rica, Panama, Colombia, Peru and Ecuador.

Literature:

Kirkbride, J. 1979. *Raritebe*, an overlooked genus of the Rubiaceae. Brittonia 31: 299–312.

a. Leaves 2 at a node.
  b. Ovary biloculate; inflorescences 15–30 cm long.
    c. Inflorescences spreading, 15–30 cm wide; leaves glabrate above.
      d. Leaves oblong lanceolate, scarcely falcate, the blades 2–3 times longer than wide ---- 4. *R. panamensis*
      dd. Leaves narrowly lanceolate, obviously falcate, the blades more than 3 times longer than wide ---- 6. *R. victoriae*
    cc. Inflorescences contracted, less than 6 cm wide; leaves appressed pilose above.
      e. Leaves to 13.5 cm wide; petioles to 4 cm long; flowers ca. 1.5 cm long; lower half of inflorescence axis unbranched ---- 1. *R. blumii*
      ee. Leaves to 8 cm wide; petioles ca. 1 cm long; flowers ca. 1 cm long; lower half of inflorescence axis branched ---- 2. *R. darienensis*
  bb. Ovary uniloculate; inflorescence less than 6.5 cm long ---- 3. *R. euryphylla*
aa. Leaves 3 at a node ---- 5. *R. trifoliatum*

1. **Raritebe blumii** (Dwyer) Dwyer, comb. nov.

Dukea blumii Dwyer, Ann. Missouri Bot. Gard. 53: 365. 1966. TYPE: Panama, *Pittier 4223* (MO, holotype).

Trees?, the branchlets glabrous to pubescent, angular. *Leaves* lanceolate or ovate lanceolate, 7–38 cm long, 2.3–13.5 cm wide, deltoid and short acuminate at the apex, acute at the base, usually slightly inequilateral, the costa prominent or immersed above, prominent beneath, the lateral veins 16–20, those in the middle of the blade 1.5–2.5 cm apart, the intervenal areas spreading reticulate, papyraceous, glabrate to appressed white villose above, villose beneath; petioles 1–4 cm long, to 0.3 cm wide. *Inflorescences* subcylindriform or spiciform, 2–15 cm long, 0.8–5.0 cm wide, the peduncles plane, 0.8–7.0 cm long, villosulose, the branches few, paired, usually strongly dilated basally, ascending, 0.3–1.5 cm long, the cymules spreading, few flowered; bracteoles ca. 0.5 mm long, deciduous. *Flowers* with the pedicels to 0.5 cm long, densely golden pubescent; hypanthium to 3 mm long, puberulent, the calycine cup short, the teeth 5, minute, ca. 0.3 mm long; corolla to 10 mm long, the tube narrowly cylindrical, in bud somewhat falcate, petaloid, pubescent outside, glabrate within, the lobes 4, linear, to

6 mm long; stamens 5, the anthers linear subulate, to 4 mm long, attenuate acuminate, the thecae divergent, tapering acutely at the apex, the acumen petaloid, to 1 mm long; style with the lobes linear, ca. 2 mm long, scarcely wider than the style. *Fruits* not seen.

Raritebe blumii is known only from Panama.

COLÓN: Around Dos Bocas, Rio Fato Valley, *Pittier 4223* (MO, US). DARIÉN: Cerro Pirre, *Duke & Ellias 13782* (MO). VERAGUAS: 6–7 km W of Santa Fe, new road past agricultural school, 2900 ft, *Nee 9811* (MO).

2. **Raritebe darienensis** (Dwyer) Dwyer, comb. nov.

Dukea darienensis Dwyer, Ann. Missouri Bot. Gard. 53: 365. 1966. TYPE: Panama, *Terry & Terry 1487* (MO, holotype).

Shrubs or small trees, to 3 m tall, the branchlets pilose. *Leaves* lanceolate, 15–25 cm long, 6–8 cm wide, acuminate, the acumen to 1 cm long, somewhat deltoid at the base, the lateral veins 12–16, those in the middle 1.0–1.5 cm apart, papyraceous, with short, white, appressed hairs above, below golden puberulent especially on the costa and the veins; petioles to 1 cm long, ca. 0.1 cm wide; stipules triangular, to 0.7 cm long, pubescent. *Inflorescences* terminal, paniculate, to 11 cm long, to 6 cm wide, the peduncle villose, to 3 cm long, the corymbs terminal, spreading, the flowers on each branch ca. 7; bracts and bracteoles subulate, minute. *Flowers* with the pedicels to 0.25 cm long, golden puberulent; hypanthium urceolate, ca. 1 mm long, villosulose, the calycine cup short, coroniform, to 1.3 mm long, the teeth 5, scarcely measurable; corolla white, the tube 4–5 mm long, ca. 0.8 mm wide, puberulent outside, the lobes 4 (or 5?), linear, to 4 mm long; stamens 5, the anthers linear, ca. 3 mm long, the filaments ca. 1 mm long; ovary with a slender, median septum, the stigmas ca. 2.5 mm long, straight. *Fruits* not seen.

Raritebe darienensis is known only from Panama.

DARIÉN: Cana-Cuasí Trail (Camp 2), Chepigana District, *Terry & Terry 1487* (MO, holotype).

3. **Raritebe euryphyllum** (Standley) Dwyer, comb. nov.

Coussarea euryphylla Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 224: 294. 1929. TYPE: Panama, *Cooper 228* (F).
C. colonis Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 179. 1940. TYPE: Panama, *Cooper 228* (F).
Dukea euryphylla (Standley) Dwyer, Ann. Missouri Bot. Gard. 53: 366. 1966.

Trees to 4.5 m tall, the branchlets glabrous. *Leaves* lanceolate or somewhat falcate-lanceolate, 27–35 cm long, 10–12 cm wide, acuminate, the acumen to 1 cm long, cuneate at the base, the lateral veins 17–20, the median veins 1–2 cm apart, thickly papyraceous, with a few white, appressed hairs above, minutely puberulent beneath especially on the costa and the veins; petioles 1.0–2.5 cm long, 0.1–0.3 cm wide; stipules subulate to triangular, 0.8–1.5 cm long. *Inflorescences* terminal, paniculate, to 8 cm long, to 6 cm wide, the peduncle ca. 2 cm long, ca. 0.1 cm wide, the branches few, to 2 cm long, the cymules few flowered; bracts subulate, to 2 mm long; bracteoles minute. *Flowers* with pedicels to 0.35

cm long, puberulent; hypanthium urceolate, 2.0–3.5 mm long, moderately puberulent, the calycine cup 1.0–1.5 mm long, the teeth 5, minute; corolla with the tube cylindrical, 9–10 mm long, the lobes slender, to 3 mm long; stamens 5, the anthers linear subulate, to 4 mm long, attenuate acuminate at the apex; ovary uniloculate, the placentas 2, parietal and arising from the base of the locule, soon bifurcating, the stigmas 2, subulate, ca. 2 mm long. *Fruits* not seen.

Raritebe euryphyllum is known only from Panama.

BOCAS DEL TORO: Almirante (or Buena Vista Camp on Chiriqui Trail?), *Cooper 228* (F). Fish Creek Mts., Chiriquí Lagoon, *Wedel 2248* (MO). DARIÉN: Cerro Pirre, *Bristan 605* (MO). Cerro Campamento, S of Cerro Pirre, Elfin Forest, *Duke 15694* (MO).

4. **Raritebe panamensis** (Dwyer) Dwyer, comb. nov.

Dukea panamensis Dwyer, Ann. Missouri Bot. Gard. 53: 364. 1966. TYPE: Panama, *Williams 832* (US).

Raritebe palicoureoides Wernham ssp. *dwyerianum* Kirkbr., Brittonia 31: 304. 1979. TYPE: Panama, *Kirkbride & Hayden 273* (MO).

Small *trees*, 3–7 m tall, the branchlets glabrate or puberulent. *Leaves* with blades elliptic lanceolate or ovate oblong, often falcate, 7–35 cm long, 6.0–13.5 cm wide, acute and short acuminate at the apex, ultimately acute, attenuate acute at base, the costa prominulous to plane above, prominent beneath, the lateral veins 12–17, the median veins 1.5–2.0 cm apart, thickly papyraceous to subcoriaceous, glabrous to sparsely appressed villose above, appressed villose beneath, the petioles 2–6 cm long, to 0.35 cm wide, often twisted; stipules narrowly triangular, to 2 cm long, to 1 cm wide, acute, coriaceous, arachnoid pubescent. *Inflorescences* terminal, solitary, usually shorter than the terminal leaves, cymose, thrysoid, to 22 cm long, to 16 cm wide, the peduncles elongate, to 12 cm long, the branches opposite, 1–8 cm apart, often branched, the branches few, the cymules patulous, few flowered, the bracteoles subulate, to 3 mm long, deciduous. *Flowers* with pedicels to 0.7 cm long, the hypanthium rotund, ca. 1.5 mm long, the calycine cup ca. 1 mm long, carnose, eglandular within, the teeth 4–5, disposed as mere points, the corolla white, with the tube cylindrical, 4.5–9.0 mm long, ca. 1 mm wide, glabrous to farinose within, minutely puberulent adaxially, the lobes 4–5, linear oblong, to 6 mm long, minutely papillate within adaxially, the stamens 4–5, the anthers linear subulate, to 4.5 mm long, attenuate acuminate, the filaments ca. 0.5 mm long attached near the middle of the tube, the ovarian disc ca. 0.3 mm long, about 2 times wider than long, the style to 5 mm long, slender, the stigmas ca. 2 mm long, each about as wide as the style. *Fruits* with pedicels filiform, to 10 mm long, the berries rotund, to 5 mm in diam., sparsely puberulent, black when dry, with a few slender longitudinal veins.

Raritebe panamensis is restricted to Panama. The type of *Bertiera panamensis* Standley (N. Am. Fl. 32: 180. 1934) looks like *Raritebe panamensis* but lacks stipules, making a critical comparison difficult.

COCLÉ: N of El Cope, 9.4 km above El Cope, 750–900 m, *Croat 44664* (MO). 7 km N of El Cope de Veraguas, ca. 900 m, *Folsom 1232* (MO). Alto Calvario, 7 km N of El Cope, 700 m, *Folsom 2483* (MO). Cerro Pilon, 5 km NE of El Valle, 800–1045 m, *Mori 6568, 6617* (both MO). COLÓN: Rio Guanche, ca. 3–5 km above Portobelo bridge, *Croat 37013* (MO). DARIÉN: Cerro Pirre, *Bristan 605* (MO); *Duke 5337* (MO). Cerro Campamento, S of Cerro Pirre, *Duke 15694, 15713* (both MO). Cerro Pirre, Summit, *Gentry & Clewell 7035* (MO). Cerro Mali, 1200–1400 m, *Gentry & Mori 13703* (MO). Caná Trail between Cerro Campamento and La Escalera to "Paramo," E of Tres Bocas, *Kirkbride*

& Duke 1309, 1332 (both MO). Caná, *Williams 832* (US). PANAMÁ: Cerro Campana, *Croat 17176* (MO). Cerro Jefe, *Croat 22653* (MO). El Llano-Cartí Road, 360–400 m, *Croat 25157* (MO); *D'Arcy 10612* (MO). Between Cerro Jefe and La Eneida, *Dwyer 8238* (MO). Cerro Jefe, *Dwyer & Gentry 9458A* (MO); *Dwyer et al. 7247* (MO). W of El Llano, *Gentry 5096* (MO). 5–6 mi N of El Llano, *Gentry 5789* (MO). El Llano to Cartí Tupile, 150–400 m, *Kennedy et al. 3135* (MO). Cerro Campana, *Kirkbride & Hayden 270* (MO). Campo Tres, 3 mi NE of Altos de Pacora, *Liesner 544* (MO). El Llano-Cartí Road, *Maas et al. 1769* (MO); *Mori & Kallunki 2297, 2330, 4123, 5584* (all MO). Cerro Campana, 870–1000 m, *Mori & Kallunki 2499, 3585* (both MO). Gorgas Memorial Labs, 25 km NE of Cerro Azul on Río Piedras, *Mori & Kallunki 3266* (MO). 5–10 km NE of Altos de Pacora, *Mori et al. 4200, 4976* (both MO). El Llano-Cartí Road, 400–450 m, *Nee et al. 8796* (MO). VERAGUAS: Cerro Tuté, ca. 10 km NW of Santa Fé, *Mori 6259, 6772* (both MO). NW of Santa Fé, 2 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5246* (MO).

5. **Raritebe trifoliatum** (Dwyer & Hayden) Dwyer, comb. nov.

Dukea trifoliata Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 139. 1967. TYPE: Panama, *Dwyer 1933* (MO, holotype).

Subshrubs to 1.3(–3.0) m tall, the branchlets angular, densely pubescent, canaliculate. *Leaves* usually 3 per node, elliptic or obovate elliptic, 15–33 cm long, 6–11 cm wide, obtuse or widely deltoid at the apex, occasionally falcate, acuminate, the acumen to 1 cm long, basally cuneate to attenuate acute, often slightly inequilateral, the costa prominulous or immersed above, prominent beneath, the lateral veins ca. 17, widely arcuate, the intervenal areas spreading reticulate, rigidly papyraceous, diffusely appressed pilose to glabrate above, strongly appressed pilose beneath; petioles 0.8–2.5 cm long, ca. 0.3 cm wide, lignose, often twisted, densely pubescent; stipules ovate lanceolate, to 2 cm long, ca. 0.7 cm wide at the base, tapering narrowly at the apex, acute or obtuse, longitudinally striate, appressed pilose, the base of the hairs usually somewhat turgid. *Inflorescences* terminal, solitary, thrysoid cymose, 3–9 cm long, the peduncles to 6 cm long, stout, usually twisted, 1.5–3.5 mm wide, densely puberulent, the branches few, the lowermost paired, 2.0–2.8 cm long, 1.0–1.6 mm wide, often somewhat deflexed, to 3 cm apart, the cymules terminal; bracts and bracteoles subulate, densely golden pilose. *Flowers* (bud) with the hypanthium ca. 1 mm long, the calycine cup elongate, cylindrical urceolate, to 2.5 mm long, the hairs dense, appressed inside and out, carnose, often drying black, the teeth 4–5, often unequal, triangular subulate to subulate, to 0.5 mm long, ciliate; corolla cream colored or green, to 4.5 mm long, less than 2 times the length of the hypanthium and the calycine tube, the tubes densely appressed pubescent outside, glabrous within, the lobes 4 or 5, short; stamens 5, the anthers narrowly oblong, 2.2 mm long, the apex petaloid, acuminate for 0.5 mm, acute, the filaments short; style slender, the stigmas 2, small. *Fruits* rotund, to 0.7 cm in diam., orange, drying red or occasionally black, pubescent, delicately ribbed and rugulose, the fleshy surface marcescent; seeds rotund, reticulate, glandular shiny.

Raritebe trifoliatum is known only from Panama.

BOCAS DEL TORO: Quebrada Huron on Cerro Bonyik, *Kirkbride & Duke 603* (MO). COCLÉ: El Valle, *Dwyer 1933* (MO). Cerro Pilon, *Dwyer 7925* (MO, US), *8355A* (MO). Cerro Gaital Caracoral, *Dwyer & Correa 8849* (MO). Cerro Pilon, *Kirkbride 1055, 1119* (both MO); *Lallathin 32-B* (MO). VERAGUAS: Río Primero Braso, 2.5 km beyond Agricultural School Alto Piedra near Santa Fé, 700–750 m, *Croat 25490* (MO). Road between Alto Piedra school and Río Calovebora, ca. 500 m, *Croat & Folsom 34106* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3914* (MO).

6. **Raritebe victoriae** (Dwyer) Dwyer, comb. nov.

Dukea victoriae Dwyer, Ann. Missouri Bot. Gard. 53: 364. 1966. TYPE: Panama, *Duke 6099* (MO, holotype).

Shrubs, the branchlets pubescent. *Leaves* falcate lanceolate, 16–27 cm long, 3.5–8.0 cm wide, narrowly falcate acuminate at the apex, cuneate at the base, the costa prominulous above and beneath, the lateral veins ca. 20, the median veins 1.5–2.0 cm apart, glabrescent above, golden villosulose beneath, especially on the veins; petioles to 4.5 cm long, ca. 1.3 cm wide; stipules narrowly triangular subulate, to 1.5 cm long, acute, pubescent. *Inflorescences* terminal and axillary, shorter than the terminal leaves, the peduncle either absent and then with 3–4 axes arising from the tip of the twiglet, slender, to 5 cm long, divergent, puberulent, or the peduncle to 1.5 cm long, ca. 0.2 cm wide, pubescent, the cymules subflabellate; bracts subulate, to 3 mm long; bracteoles minute. *Flowers* pedicellate, the pedicels to 6 mm long; hypanthium urceolate, to 2 mm long, sparsely pubescent, the calycine cup to 1 mm long, truncate, the teeth 4, much reduced; corolla tube cylindrical, to 2.5 mm long, ca. 0.8 mm wide, glabrous, subcarnose, the lobes a little longer than the tube; stamens 5, the anthers linear, ca. 2 mm long, attenuate toward the apex, ultimately obtuse, the filaments ca. 0.8 mm long, affixed to the base of the tube; style ca. 1 mm long, the stigmas linear, ca. 1 mm long. *Fruits* not seen.

Raritebe victoriae is known only from Panama.

DARIÉN: Cerro Pirre, *Duke 6099* (MO).

70. RAVNIA

Ravnia Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 49. 1852. TYPE: *R. triflora* Oerst.

Epiphytic *shrubs*. *Leaves* fleshy, the lateral veins frequently evanescent; stipules interpetiolar, large, oblong, obtuse (fide Standley). *Flowers* large, 1–3 at the end of the branchlets; hypanthium turbinate, the calycine cup absent or greatly reduced, the lobes absent or 5–6, minute to conspicuous, narrowly oblong, often persisting in fruit; corolla with the tube cylindrical or ampliate at maturity, petaloid, the lobes 5–6, valvate, short, finally reflexed; stamens 5–6, the anthers oblong, attached by very short filaments to the mouth; ovary 2-celled, the ovules numerous, attached to a median septum, ascending, the style filiform, elongate, the stigmas 2, short, obtuse. *Fruits* capsular, elongate and narrowly oblong, splitting septicidally from a thin septum; seeds small with a distal tuft of elongate hairs.

Ravnia is known only from Central America, probably confined to Costa Rica and Panama. It is made up of 3 species. The genus is in need of intensive field study, especially from the viewpoint of floral development.

FIGURE 82. *Ravnia triflora* Oerst.—A. Habit (×½). [After *Woodson & Schery 559.*]—B. Flower opened to show interior (×¾). [After *Lent 1225*, Costa Rica.]—C. Fruit (×½).—D. Seed (×1½). [After *Gómez 2230*, Costa Rica.]

1. **Ravnia triflora** Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 49. 1852. TYPE: Costa Rica, collector not given.—FIG. 82.

R. pittieri Standley, N. Am. Fl. 32: 114. 1921. TYPE: Costa Rica, *Pittier 13461* (NY).
R. longifilamentosa Steyermark, Ceiba 3: 21. 1952. TYPE: Panama, *Allen 4744* (F, holotype).
R. panamensis Steyermark, Ceiba 3: 22. 1952. TYPE: erroneously omitted.

Epiphytic *shrubs*, usually anisophyllous, branching loosely, the stems glabrous, the nodes well spaced. *Leaves* occasionally sessile, lanceolate to ovate lanceolate, 4.5–17.0 cm long, 1.7–4.0 cm wide, the larger leaves usually 4 times longer than wide, the small anisophyllous leaves ¼ to ½ the length of the larger leaves, the smallest mostly ovate or ovate lanceolate, the larger often falcate, acute or narrowly deltoid toward the apex, often gradually caudate, basally acute, cuneate or rounded, the costa plane or prominulous above, prominulous beneath, the lateral veins 4–7, not evident or only faintly visible, sharply arcuate ascending, papyraceous to subcoriaceous, concolorous, often farinose, glabrous; petioles absent or to 1.5 cm long; stipules deciduous, free, the body oblong, ca. 2.5 mm long, drying tan, puberulent, with 2 linear oblong awns to 7 mm long, puberulent, 3-veined. *Flowers* solitary or to 3 at the end of the twiglet, the peduncle absent or scarcely measurable; bracts subtending flowers paired, deciduous, oblong, to 2.2 cm long, ca. 0.8 cm wide, obtuse, chartaceous, glabrous. *Flowers* sessile or subsessile; hypanthium turbinate, ca. 5 mm long, ca. 2 mm wide, the calycine cup absent, the calycine teeth absent or 5–6, linear oblong, unequal, 1–12 mm long, glabrous; corolla with the tube narrowly cylindrical or widely hypocrateriform, 3.5–6.5 cm long, 0.8–1.6 cm wide, glabrous, venose, the lobes 5–6, erect when immature, reflexed at maturity, linear oblong or triangular, to 6.5 mm long at maturity, obtuse; stamens 5–6, exserted or included, the anthers oblong, ca. 4 mm long, the filaments 2–3 mm long, attached near the mouth; style slender, 38–50 mm long, ca. 0.3 mm wide. *Fruits* narrowly oblong or narrowly obovate, often falcate, to 7 cm long, to 0.9 cm wide, each valve often with delicate longitudinal lines, the calycine teeth persistent or deciduous from a somewhat rounded fruit apex; seeds numerous, narrowly cuneate, ca. 0.2 mm wide, proximally slender, distally thicker, the terminal hairs to 20 mm long.

Ravnia triflora is known only from Costa Rica and Panama. The corolla tube in maturing passes from a cylindrical shape to a gibbous state with its lobes becoming reflexed, exposing the anthers. This is why I consider all the collections to represent one species plausible. The calycine lobes may be absent or may range from 1–15 mm in length. Anisophylly is of little importance as a diagnostic character, as well as is the number of flowers at the tip of the twig. The stipules and bracts were described from *Folsom 4361* (MO).

CHIRIQUÍ: Southern slopes of Quebrada Velo, vicinity of Finca Lerida, 1631 m, *Allen 4744* (F). Cerro Horqueta, *Hagen & Hagen 2168* (F). Upper Río Chiriquí Viejo, *White & White 33* (MO), *39* (F, MO). Bajo Mono and Quebrada Chiquero, *Woodson & Schery 559* (MO). COCLÉ: Cerro Pilón, *Croat 14341* (MO); *Duke & Lallathin 14997* (MO). Asceradera Rivera, Alto de Calvario, 7 km N of El Cope, 700 m, *Folsom 2340* (MO). DARIÉN: Cerro Pirre, valley between Pirre and mountain directly S, *Folsom 4361* (MO). Cerro Pirre, *Gentry & Clewell 6971, 7032 A* (both MO). PANAMÁ: Altos de Pacora, 15–20 km WNW of Cerro Azul, ca. 800 m, *Mori et al. 6913* (MO). VERAGUAS: Road between Escuela Agricola and Alto Piedra, above Santa Fé and Río Dos Bocas, ca. 5–8 km from Escuela, 730–770 m, *Croat 25944* (MO). 0.6 mi beyond Escuela Agricola Alto Piedra, *Croat & Folsom 34048* (MO). 5 mi W of Santa Fé, *Liesner 876* (MO). N of Santa Fé, ca. 2 km N of Escuela Agricola Altos de Piedras, *Mori & Kallunki 2600* (MO).

71. RELBUNIUM

Relbunium (Endl.) Benth. & Hook. f., Gen. Pl. 2: 149. 1873.

Rubia sect. *Involucratae* DC., Prodr. 4: 590. 1830. TYPE: not selected.
Galium sect. *Relbunium* Endl., Gen. Pl. 523. 1839. TYPE: *Relbunium hypocarpium* subsp. *nididum* (H.B.K.) Ehrendf. (fide Ehrendorfer).

Herbs, annual or perennial, erect or sprawling. *Leaves* opposite, together with the stipules disposed verticillately. *Inflorescences* pedunculate, the flowers solitary to numerous; flowers usually bisexual and sessile, enveloped by an involucre of 2–4 bracts. *Flowers* with the calycine cup bearing reduced or obsolete lobes, not persistent in fruit; corolla rotate, the lobes 4, valvate; stamens 4, exserted, the filaments attached at the mouth; ovary 2-celled, the ovules solitary in each cell, the style branches 2. *Fruits* fleshy, didymous, 1 seed per cell or 1 seed aborting; seeds oblong, the ventral surface concave.

Relbunium, a genus of about 30 species, ranges from Mexico to Central America, the West Indies and northern South America. It bears a striking resemblance to *Galium* but its flowers are involucrate.

Literature:

Ehrendorfer, F. 1955. A revision of the genus *Relbunium* (Endl.) Benth. et Hook. (Rubiaceae-Galieae). Bot. Jahrb. Syst. 76: 516–533.

1. **Relbunium hypocarpium**[129] (L.) Hemsley, Biol. Centr. Amer., Bot. 2: 63. 1881.—FIG. 83.

Vaillantia hypocarpia L., Syst. Nat., ed. 10, 1307. 1759. TYPE: Jamaica, *Browne* (?LINN 1219.13).
Rubia incana H.B.K., Nov. Gen. Sp. Pl. 3: 338. 1819. TYPE: not seen.
R. hispida Willd. ex Spreng., Syst. Veg. 1: 397. 1825.
Relbunium hypocarpium var. *incanum* (H.B.K.) Schum. in Mart., Fl. Bras. 6(6): 113. 1888.

Herbs creeping, branching freely, the stems weak, 4-angled, 0.7–1.0 mm wide, the angles thickened, villose, the nodes usually well spaced. *Leaves* 4 per node, sessile, oblong, obovate oblong, oblong rotund, 0.3–1.3 cm long, 0.2–0.7 cm wide, deltoid to rounded at the apex, minutely apiculate, obtuse at the base, the costa evanescent above, villose, plane and usually evident beneath, the secondary veins ca. 3, evanescent above and beneath, arcuate, stiffly chartaceous, smooth, usually glandular shiny above, often marcescent, white hirsute, the hairs to 0.7 mm long, often confined to the costa above, glandular punctate; stipules probably connate, scarcely measurable. *Flowers* solitary in the axils, the pedicels articulate with the bracteoles, to 0.8 cm long, filamentous, usually rigid, the bracteoles 4, immediately subtending the flower, lanceolate to ovate oblong, 2.8–4.0 mm long, hirsute; hypanthium ovate rotund, the calyx cup and teeth absent; corolla white, the tube cylindrical, short, the lobes 4, similar in shape to the bracteoles, shorter than and alternate with bracteoles, glabrous except usually marginal hairs; stamens 4, the anthers oblong, obtuse, the filaments short, attached at the mouth; style short, the stigmas 2, short, obtuse. *Fruits* fleshy, usually didymous, orange red, rotund, 2–3 mm long, often wider than long, glabrous to pubescent.

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[129] For more complete synonymy see Ehrendorfer (155).

FIGURE 83. *Relbunium hypocarpium* (L.) Hemsl. Habit (×⅔). [After *Woodson & Schery 442.*]

Relbunium hypocarpium is common in the mountains of Mexico, Central America, West Indies, and South America.

CHIRIQUÍ: Cerro Horqueta, 7000 ft, *Blum & Dwyer 2658* (MO). Cerro Punta to Las Nubes, 6000 ft, *Correa 1344* (MO). N of Cerro Punta, *Croat 10454* (MO). Las Nubes, ca. 2000 m, *Croat 26417* (MO). Cerro Punta Bajo Grande, *Croat & Porter 16002* (MO). Bajo Chorro, Boquete, ca. 6000 ft, *Davidson 428* (F, MO). La Popa above Boquete, 5500 ft, *D'Arcy & D'Arcy 6361, 6442* (both MO). Cerro Horqueta, ca. 1500 m, *Duke et al. 13699-A* (MO). Finca Collins, Boquete, ca. 5000 ft, *Dwyer & Hayden 7703* (MO). Cerro Punta, *Folsom 4019* (MO). Boquete to 3 mi N, *Lewis et al. 379* (GH, K, MO, NY, UC, US). El Barú, above 11,000 ft, *Tyson & Loftin 6160* (MO). Rio Chiriquí Viejo Valley, *White 73* (F, MO). Finca Lerida to Pena Blanco, 1750–2000 m, *Woodson & Schery 335* (F, MO). Potrero Muleto to summit Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 442* (MO). Boquete, *Woodson & Schery 771* (MO). Casita Alta, *Woodson et al. 827* (NY). Loma Larga to summit, Volcán de Chiriquí, *Woodson et al. 1076* (F, MO, NY), *1089* (MO).

72. RICHARDIA

Richardia L., Sp. Pl. 1: 330. 1753, not *Richardia* Kunth, Mém. Mus. Hist. Nat. 4: 433, 437, 1818. (=*Zantedeschia* Sprengel), not *Richardia* Adans. Fam. 2: 158. 1763. Nomen rejic.

Richardsoniana Kunth ex H.B.K., Nov. Gen. Sp. Pl. 3: 350. 1819.
Schiedia Bartl. Ord. 210. 1830, not Cham. & Schl. 1826; not Richard 1834. TYPE: *S. martinicensis* (DC.) A. Richard.
Tertrea DC., Prodr. 4: 481. 1830. TYPE: *T. martinicensis* DC.

Plants herbaceous, the stems terete, usually densely pubescent. *Leaves* with the blades usually wide; stipules adnate to the petioles, the sheath multisetose. *Inflorescences* terminal, capitate, sessile, subtended by conspicuous foliose involucral bracts. *Flowers* with the calycine cup turbinate or subglobose, the lobes 4–8, connate. *Fruits* partly superior, dry, the cocci indehiscent; seeds with the strophiole very narrow and short, the cells of the testa isodiametric to contorted.

Richardia is known from the United States, Mexico, Central America, South America, and the West Indies. There are about 5 species in the genus.

Literature:

Lewis, Walter H. & Royce L. Oliver. 1974. Revision of *Richardia* (Rubiaceae). Brittonia 26: 271–301.

Richardia scabra L., Sp. Pl. 330. 1753. TYPE: Mexico (LINN 451.1) Fig. 4.—FIG. 84.

Richardsonia scabra (L.) St. Hilaire, Pl. Us. Bras. 8: 1. 1824.
Richardia pilosa Ruiz & Pavón, Fl. Peruv. Chil. 3: 50. 1802. TYPE: Peru, *Pavón* (MA).
Richardsonia pilosa (R.&P.) H.B.K., Nov. Gen. Sp. Pl. 3: 350. 1819.
Richardia cubensis A. Rich. in Sagra, Fl. Cub. 2: 31. 1853. TYPE: Cuba, *Franqueville* (F, K).

Annual *herbs*, erect to decumbent, often sprawling, branching loosely, hirsute. *Leaves* ovate to oblong lanceolate, rarely linear lanceolate, 1.5–6.5 cm long, 0.3–1.5 cm wide, obtuse to acute at the apex, attenuate at the base, scabrous

FIGURE 84. *Richardia scabra* L. Habit (×⅓). [After *D'Arcy 5387.*]

above and beneath, more so on the lateral veins; petioles to 5 mm long; stipules with the sheath ca. 2 mm wide, the marginal setae to 5 mm long. *Inflorescences* terminal, capituliform, the flowers numerous, to 20, the involucral leaves in 2 pairs, the larger pair widely ovate and estipulate. *Flowers* with the hypanthium rotund, the calycine tube 0.35–0.50 mm long, the lobes 5–6, unequal, subulate or linear oblong, 1.7–2.3 mm long, acute to subobtuse, the margin ciliate, the hairs to 0.7 mm long; corolla white, occasionally lavender, the tube funnel shaped, ca. 4.5 mm long, constricted below the middle, glabrous, the lobes 5, oblong, 0.5–2.5 mm long; stamens 6, the anthers subrotund, 0.5 mm in diam.; stigmas 3, slender, ca. 1 mm long, the style ca. 4 mm long, the ovary 3-loculate. *Fruits* with mericarps 3, the adaxial face closed, with a narrow groove, the abaxial face papillose, more or less strigose.

Richardia scabra is a common weed ranging from North America through Central America and the Greater Antilles to northern South America east to Guyana.

CANAL ZONE: Miraflores, *Bristan P-6* (MO). Sosa Hill, *Duke 4653* (MO). Frijoles, *Ebinger 627* (MO). Gamboa Golf Club, *Nee 7298* (MO). CHIRIQUÍ: Volcan, *Croat 10406* (MO). El Hato Del Volcan, *Croat 10699* (MO). Volcan, *Duke 9168* (MO). Llanos Francia, 4 mi from Boquete, *Dwyer & Hayden 7618* (GH, MO, US). Llanos Francia, near Boquete, *Stern et al. 1178* (MO). 2 mi SE of Guabala, *Tyson & Smith 4240* (MO). Upper Chiriquí Viejo Valley, *White 237* (MO). COCLÉ: 20 mi S of Nata, *D'Arcy & Croat 4119* (MO). El Valle, *Folsom 3134* (MO). NE of El Valle, *Lewis et al. 1810* (GH, MO, US). 10 mi E of Nata at Rio Grande, *Tyson 5294* (MO). Las Margaritas and El Valle, *Woodson et al. 1269* (MO). COLÓN: Rio Piedras, road to Portobelo, *Blum et al. 2547* (MO). LOS SANTOS: Monagre Beach, 5 mi SE of Chitre, *Tyson et al. 3012* (MO). PANAMÁ: Río Mar, *Duke 11782, 12413* (both MO). Cerro Jefe, *Dwyer & Gauger 7326* (MO); *Gentry 2139* (MO). 1 mi N of Goofy Lake, *Oliver et al. 2688* (MO). Río Pacora to Chepo, *Porter et al. 5149* (MO, SCZ, UC). Chepo, *Wilbur & Luteyn 11797* (MO). VERAGUAS: Laguna La Yeguda, 15 mi N of Calobre, *Luteyn 1450* (MO).

73. RONDELETIA

Rondeletia L., Sp. Pl. 172, 1753. TYPE: *R. americana* L.

Petesia P. Br., Civ. Nat. Hist. Jam. 143, *tab. 2 & 3,* 1756. TYPE: not designated.
Lightfootia Screb., Gen. Pl. 122, 1789, not Swartz 1788, not L'Her. 1788. TYPE: not given.
Willdenovia J. F. Gmelin, Syst. Nat. 2: 362, 1791, not Thunb. TYPE: *W. schreberi* Gmel.
Arachnimorpha Desv. in Hamilt., Prodr. 28, 1825. TYPE: not designated.
Rogiera Planch., Fl. Serres 5: 442, 1849. TYPE: *R. amoena* Planch.
Arachnothryx Planch., Fl. Serres 5: 442. 1849. TYPE: *R. buddleioides* Benth.

Shrubs or trees. *Leaves* coriaceous to membranous, often acuminate; stipules interpetiolar, free, mostly entire. *Inflorescences* terminal or axillary, usually paniculate, rarely thrysoid, rarely racemose or spiciform, pedunculate. *Flowers* with the hypanthium rotund or oblong, the calycine cup with 4–6(–7) lobes, the lobes occasionally foliaceous; corolla tube narrowly cylindrical, hairs present or absent within, occasionally the mouth with a ringlike thickening, the lobes 4–6, imbricate; stamens 4–6, the anthers oblong, dorsifixed, the filaments often unequal; ovarian disc annular, the style slender, the stigmas 2(–3), the ovary 2(–3) celled, the septum complete or incomplete, the ovules numerous. *Fruits* capsular, globose or rotund, the valves 2, splitting loculicidally or septicidally, each valve often split; seeds numerous, exalate or winged at one or both poles.

Rondeletia, with about 125 species, is found in the West Indies, Mexico, Central America and South America. The author acknowledges assistance from Kirkbride.

Literature:

Kirkbride, J. 1969. A revision of the Panamanian species of *Rondeletia* (Rubiaceae). Ann. Missouri Bot. Gard. 3: 372–391.

The key below has been adapted from Kirkbride's key.

a. Leaves bullate ..... 9. *R. odorata* var. *breviflora*
aa. Leaves not bullate.
  b. Leaves with dense white indumentum beneath.
    c. Leaves arachnoid-tomentose beneath; calycine lobes 10–13 mm long ..... 6. *R. darienensis*
    cc. Leaves white tomentose beneath; calycine lobes to 2 mm long ..... 3. *R. buddleioides*
  bb. Leaves glabrate beneath.
    d. Leaves subcoriaceous; stipules reflexed ..... 1. *R. amoena*
    dd. Leaves membranous or chartaceous; stipules erect.
      e. Flowers 4-merous; fruit septicidal (not seen in *R. d'arcyi* and *R. kirkbridei*), loculicidal in *R. secunda.*
        f. Calycine lobes unequal in length.
          g. Calycine lobes inconsistent as to one being 2 times longer than the other ..... 5. *R. darcyi*
          gg. Calycine lobes unequal in length, with one 2 or more times longer than the other 3.
            h. The large calycine lobe 2.0–7.5 mm long, capsule strigose or glabrous.
              i. Hypanthium densely strigose or puberulent.
                j. Hypanthium densely strigose, corolla tube 9–11 mm long, white ..... 4. *R. cooperi*

jj. Hypanthium puberulent; corolla tube ca. 20 mm long, pink or lavender ..... 8. *R. kirkbridei*

ii. Hypanthium arachnoid tomentose.

k. Small calycine lobes linear or narrowly oblong, 1.7–4.0 mm long; capsule loculicidal ..... 13. *R. secunda*

kk. Small calycine lobes triangular, 0.3–1.8 mm long; capsule septicidal ..... 2. *R. bertieroides*

hh. The large calycine lobe 6.0–11.5 mm long ..... 12. *R. salicifolia*

ff. Calycine lobes about equal in length ..... 11. *R. platysepala*

ee. Flowers 5-merous; fruits loculicidal.

l. Calycine lobes 1–2 mm long; corolla tube 6–9 mm long ..... 7. *R. hamelifolia*

ll. Calycine lobes ca. 8.5 mm long; corolla tube 11–18 mm long ..... 10. *R. panamensis*

1. **Rondeletia amoena** (Planch.) Hemsley, Diag. Pl. Nov. 26. 1879.

Rogiera amoena Planch., Fl. Serres 5: 442. 1849. TYPE: not seen.
R. menechma Planch., Fl. Serres 5: 442. 1849. TYPE: not seen.
Rondeletia versicolor J. Smith, Bot. Mag. *tab. 4579*. 1851. TYPE: not seen.
R. latifolia Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 43. 1852. TYPE: not seen.
R. rugosa Bentham ex Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 43. 1852. TYPE: not seen.
Rogiera latifolia Decne., Rev. Hort. sér. 4, 2: 121. 1853. TYPE: not seen.
R. versicolor Lindley & Paxton, Fl. Gard. 2: 69. 1853. TYPE: not seen.
Rondeletia schumanniana K. Krause, Bot. Jahrb. Syst. 40: 315. 1908. TYPE: not seen.

Trees to 10 m tall, the branchlets terete, drying dull golden tan, cracking, glabrescent. *Leaves* ovate, ovate rotund, 9.0–21.5 cm long, 4.0–12.5 cm wide, regularly more than 2 times longer than wide, rounded or obtuse at the apex, the acumen deltoid, to 1 cm long, ultimately acute or obtuse, often falcate, subtruncate or cordate at base, the costa slender, immersed or prominulous above, prominent beneath, the lateral veins 5–10, the median veins to 1.5 cm apart, usually strict, the venules prominently reticulate beneath, stiffly chartaceous to subcoriaceous, usually bicolorous, rarely subbullate above, glabrous above except along costa and veins or appressed strigose or golden villose above, densely golden villose to glabrate beneath; petioles occasionally minute or to 1.5 cm long, to 0.3 cm wide, stout, golden pubescent; stipules reflexed, deltoid, 4–17 mm long, 3–10 mm wide, obtuse, sericeous outside, glabrous within except toward the margin. *Inflorescences* terminal or axillary, paniculate, to 17 cm long, the peduncle to 9 cm long, ferrugineous pilose, glabrescent, the bracteoles several. *Flowers* sessile or subsessile, the pedicels velutinous; hypanthium rotund, ca. 2 mm long, ferrugineous to white tomentose, the calycine cup ca. 0.5 mm long, the lobes 5–6, unequal, deltoid to deltoid oblong, to 0.5 mm long, occasionally wider than long; corolla white, the tube 9–15 mm long, tomentose outside, yellow pilose within near the mouth, glandular hairy toward the base within, the lobes 5–6, to 3.5 mm long, glabrous within, tomentose outside; stamens with anthers oblong, ca. 2 mm long, attached near middle of tube, the filaments to 2 mm long. *Fruits* loculicidally dehiscent, rotund to compressed rotund, to 6 mm in diam., tomentose to glabrate.

Rondeletia amoena extends from Chiapas, Mexico, to Panama.

CHIRIQUÍ: Volcan de Chiriquí Viejo, *Allen 994* (MO). "New Switzerland," Valley of Río Chiriquí Viejo, *Allen 1350* (MO). Llano del Volcán, *Allen 3469* (MO). Finca Collins, Boquete, *Blum & Dwyer 2553* (MO). 1 km from Hato del Volcán, road to Concepcion, *Correa & Lazor 1436* (MO). Methodist Camp, Nueva Swissa, *Croat 13519* (MO). N of Audubon Cabin, *Croat 13610* (MO). Monte Rey above Boquete, *Croat 15718* (MO). 2.5 mi N of Río Chiriquí Viejo, *Croat 15885* (MO). Volcán de Chiriquí, Boquete, *Davidson 951* (MO). E slope Volcán de Chiriquí, WNW Boquete, *Davidse & D'Arcy 10180* (MO). 3 km NE El Hato del Volcán, 1800 m, *Davidse & D'Arcy 10413* (MO). Valley of Río Chiriquí Viejo, N of Volcán City, *Duke 9067* (MO). Cerro Horqueta, *Duke et al. 13650* (MO). Cerro Horqueta, *Dwyer et al. 556* (MO). Boquete, *Dwyer 7000* (MO). Between Pinola and Quebrada Seco on Chiriquicito-Caldera Trail, *Kirkbride & Duke 1026, 1036* (both MO, NY). Alto Lino, 4000–5000 ft, *Maurice 839* (MO). W slope Volcán de Chiriquí, trail to summit, 2500–3400 m, *Mori & Kallunki 5740* (MO). W slope Volcán de Chiriquí, lava flow, ca. 1500 m, *Mori & Kallunki 5700* (MO). 17 km NE of San Felix on road to Cerro Colorado, 1000 m, *Nee 10719* (MO). Finca Collins, Boquete, *Stern et al. 33773* (MO). La Mesa, *Tyson 818, 6057* (both MO). Río Chiriquí Viejo Valley, *White & White 19, 35, 231* (all MO). Finca Lerida, *Woodson & Schery 227, 311* (both MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 810* (MO).

2. **Rondeletia bertieroides** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 267. 1929. TYPE: Panama, *Cooper 598* (F, holotype; NY, isotype).

Trees or shrubs, the branchlets ultimately tomentose. *Leaves* lanceolate, occasionally ovate, 5.5–23.0 cm long, 1.5–6.0 cm wide, conspicuously acuminate at the apex, rarely simply acute, cuneate to acute at base, the lateral veins 5–7, arcuate, usually stiffly chartaceous, discolorous. *Inflorescences* terminal, rarely axillary, paniculate, the peduncle 2–5 cm long or absent, the branches helicoid cymose or with reduced dichasia, the basal branches 1–8 cm long, tomentose to glabrate. *Flowers* 4-merous, the pedicels minute or to 1 mm long, tomentose, the hypanthium rotund, to 1.5 mm long, the calycine cup to 0.5 mm long, 1 lobe elliptic or obovate, (1.3–)2.0–4.2 mm long, 0.8–2.7 mm wide, acute to occasionally obtuse at the apex, the other 3 lobes triangular or oblong, 0.3–2.0 mm long, 0.5–1.0 mm wide, the corolla white, the tube 1.0–1.2 cm long, strigose outside, puberulent within below the anthers, the lobes obtuse, ca. 2.5 mm long; anthers 0.2–2.7 mm long, the filaments short; ovary with the septum entire or incompletely fused. *Capsule* globose, ca. 4 mm in diam., glabrous, septicidal, the calycine lobes persistent.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí trail, 3000 ft, *Cooper 598* (NY). Between Buena Vista Coffee Finca and Cerro Pilon, Chiriqui Trail, *Kirkbride & Duke 712, 713* (both MO). Between Criollo and Quebrada Higueron, Chiriquí Trail, *Kirkbride & Duke 799* (MO). COCLÉ: Cerro Pilon, *Croat 14402, 22944* (both MO). La Mesa, *Dwyer 8316* (MO). Cerro Pilon, *Dwyer & Lallathin 8682* (MO). Cerro Gaital Caracoral, *Dwyer & Correa 8875* (MO). Cerro Caracoral, *Kirkbride 1124* (MO). Cerro Pilon, *Liesner 788* (MO); *Porter et al. 4401* (MO), *4411* (MO, SCZ, UC, VEN). La Mesa, 2 km W of Cerro Pilon, *Sullivan 513* (MO). Cerro Pilon, 5 km NE of El Valle, *Mori 6557* (MO).

3. **Rondeletia buddleioides** Benth., Pl. Hartw. 69. 1840. TYPE: Mexico, *Hartweg 502* (B, if extant, not seen, photo MO; NY, isotype).

Arachnothryx buddleioides (Benth.) Planch., Fl. Serres 5: 442. 1849.
Rondeletia affinis Hemsley, Diag. Pl. Nov. 28, 1879. TYPE: Panama, *Seemann 1594* (K, not seen).

Trees to 15 m tall or shrubs, the branchlets ultimately white tomentose to glabrescent. *Leaves* ovate, elliptic or obovate, 2.5–20.0 cm long, 1.0–7.5 cm wide, acute to acuminate at the apex, the acumen short, the base cuneate to attenuate acute, the smaller veins perpendicular, the costa prominulous beneath, the lateral veins 10–14, arcuate, prominent and conspicuous, sparsely webby

tomentose to glabrous above, often asperous above, densely white tomentose beneath; petioles to 2 cm long, usually white tomentose; stipules polymorphic, generally linear to ovate, 4–10 mm long, 0.5–5.0 mm wide, acute. *Inflorescences* terminal or pseudo axillary, white tomentose to glabrous, the peduncle 0.5–9.0 cm long, the cymules often helicoid. *Flowers* sessile or subsessile, 4-merous, the hypanthium rotund, to 1.5 mm long, densely tomentose, the calycine lobes deltoid or oblong, 0.5–2.0 mm long, reflexed; corolla white, cream or pink, the tube 6–11 mm long, pubescent within, sparsely villous within below the middle, the lobes 2–3 mm long, papillate adaxially; stamens 4, the anthers oblong, ca. 1.5 mm long, the filaments very short, attached at middle of the tube; ovarian disc to 0.5 mm in diam., glabrous. *Fruits* subrotund, 3–4 mm in diam., septicidal, the hairs few.

a. Upper surface of the leaves nonasperous ..... 3a. var. *buddleioides*
aa. Upper surface of the leaves asperous ..... 3b. var. *aspera*

3a. **Rondeletia buddleioides** Benth. var. **buddleioides**

CANAL ZONE: Fort Sherman, Pina Highlands, *Hayden 120* (MO). CHIRIQUÍ: Finca Lerida, Quebrada Velo, *Allen 4753* (MO). Finca Collins, *Blum & Dwyer 2423A* (MO). Buena Vista Camp, Chiriquí Trail, *Cooper 615* (NY). Monte Rey above Boquete, *Croat & Porter 15675* (MO). Boquete, *D'Arcy & D'Arcy 6468* (MO). Bajo Chorro, Boquete, *Davidson 231* (MO). Volcán de Chiriquí, *Davidson 918* (MO). Boquete, *Davidson 1000* (MO). Cerro Horqueta, *Duke 13622, A13728* (both MO). Cerro Horqueta, NW of Boquete, *Dwyer et al. 551* (GH, MO, US). Boquete, *Dwyer 6955, 7004* (both MO). Boquete, Llanos Francia, *Dwyer & Hayden 7592* (MO, UC, VEN), *7626* (MO). Finca Collins, Boquete, *Ebinger 717* (MO). Cerro Horqueta, *Kirkbride 155* (MO, NY). Vicinity Pinola, Chiriquí Trail, *Kirkbride & Duke 864* (MO, NY). Between Pinola and Quebrada Seco, Chiriquicito-Caldera Trail, *Kirkbride & Duke 1023* (MO, NY). Finca Collins, Boquete, *Stern & Chambers 1128* (MO). Llanos Francia, Boquete, *Stern et al. 1199* (MO). Finca Collins, Boquete, *Stern et al. 2037, 2044* (both MO). Bambito, *Tyson 5865* (MO). Cerro Horqueta, *Hagen & Hagen 2151* (MO, NY). Upper Río Chiriquí Viejo, *White & White 28, 30* (both MO). San Ramon, Bajo Mono, *Wilbur et al. 13546* (MO). Callejon Seco, Volcán de Chiriquí, *Woodson & Schery 493* (MO). Casita Alta, Volcan de Chiriqui, *Woodson et al. 930* (MO, NY). COCLÉ: 4 km from El Valle, *Correa & Dressler 1003* (MO). Cerro Pilon and El Valle, *Duke & Dwyer 13945* (GH, MO, UC, US). Las Margaritas and El Valle, *Woodson et al. 1280, 1757* (both MO). PANAMÁ: Cerro Campana, *Allen 2650* (MO). Cerro Azul, *Blum & Dwyer 2423A* (MO). Cerro Jefe, *Croat 17363* (MO). Cerro Campana, *Duke 5997, 8680* (both MO). Cerro Azul, *Dwyer 1880, 2069* (both MO). Cerro Jefe, *Dwyer & Gentry 9426B* (MO). Cerro Campana, *Dwyer & Kirkbride 7814* (COL, DUKE, MO, UC, VEN). Cerro Azul, *Ebinger 394* (MO). Cerro Jefe, *Folsom 3814* (MO). Cerro Campana, *Lewis et al. 1912* (GH, US); *McDaniel 6812* (MO). Cerro Azul, *Porter et al. 4118* (MO, SCZ, UC, VEN). El Valle to La Mesa, ca. 2400–2600 ft, *Spellman et al. 583* (MO). Cerro Azul to Cerro Jefe, *Tyson et al. 4328* (MO).

3b. **Rondeletia buddleioides** Benth. var. **aspera** Kirkbride, Ann. Missouri Bot. Gard. 55: 379. 1968. TYPE: Panama, *Kirkbride & Duke 780* (MO, holotype; NY, isotype).

BOCAS DEL TORO: Buena Vista Camp, Chiriqui Trail, 1000 m, *Cooper 65* (F, NY). Between Criollo and Quebrada Higueron on Chiriquí Trail, *Kirkbride & Duke 780, 796* (both MO, NY).

4. **Rondeletia cooperi** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 267. 1929. TYPE: Panama, *Cooper 600* (F, holotype; isotype, NY).

Trees or shrubs, to 7 m tall, the branchlets terete, strigose, densely so terminally, the internodes variable in length. *Leaves* elliptic, 10–22 cm long, 4.0–9.5 cm wide, acuminate, the acumen to 2.5 cm long, attenuate to cuneate at the base, the costa prominent above, the lateral veins ca. 10, papyraceous, strigose

on the veins but glabrescent above, strigose on the veins beneath; petioles to 3 cm long, strigose; stipules triangular, often compressed triangular, ca. 4 mm long, sericeous strigose outside, sericeous and with digitiform processes within, to 0.8 mm long. *Inflorescences* terminal, paniculate, the branches compound dichasia, 10–25 cm long; peduncles variable in length, 3–17 cm long, strigose. *Flowers* sessile or pedicellate, the pedicels ca. 1 mm long; hypanthium ferrugineous strigose, the calycine cup ca. 0.5 mm long, the lobes variable in length, 1–2 lobes ca. 3 times longer than the others, the smaller lobes oblong to triangular, ca. 1 mm long, strigose outside; corolla white, the tube ca. 10 mm long, strigose outside, the lobes ca. 4 mm long. *Fruits* capsular, ovoid, to 4.5 mm long, costate, sparsely strigose, septicidal to about the middle, the calyx lobes persistent.

Rondeletia cooperi is known only from Panama.

BOCAS DEL TORO: Buena Vista Camp, Chiriquí Trail, 416 m, *Cooper 600* (F, NY). CHIRIQUÍ: Punta Pena, ca. 333 m, *Lewis et al. 2158* (MO). COCLÉ: Between Buena Vista coffee finca and Cerro Pilon, Chiriquí Trail, *Kirkbride & Duke 703* (MO, NY).

5. **Rondeletia darcyi** Dwyer.[130] TYPE: Panama, *D'Arcy 4079* (MO, holotype).

Shrubs?, the twiglets and leaves dark red, the twigs slender, terete, smooth, glabrescent, the nodes well spaced. *Leaves* oblong elliptic or ovate elliptic, 2–13 cm long, 1.2–5.0 cm wide, deltoid or acute toward the apex, abruptly acuminate, the acumen to 2.5 cm long, often falcate, the base obtuse or truncate, the costa prominulous beneath, the lateral veins ca. 6, arcuate, prominulous beneath, the submarginal vein ca. 3 mm from the margin, rigidly membranaceous, concolorous, glabrous above, beneath with weak and often appressed hairs especially on the costa and the veins, the hairs swollen basally; petioles to 0.5 cm long, the hairs few; stipules free, triangularly subulate, ca. 3 mm long, rigid, erect, the cusp often longer than the body, the hairs similar to those of the leaves. *Inflorescences* terminal, compressed cymose paniculate, to 5.5 cm long, to 3.3 cm wide, the peduncle slender, to 3.5 cm long, to 0.8 mm wide, the hairs weak, appressed, white, the branches slender, to 1 cm long, the inferior branches opposite; bracts subulate, to 4 mm long, the flowers few. *Flowers* with the pedicels to 4 mm long; hypanthium oblong rotund or compressed rotund, to 1.2 mm long, drying red, the hairs few, appressed, the calycine cup very short, the lobes 4, narrowly oblong, 2.3–4.2 mm long, unequal, sometimes with one 2 times longer than the others, unequal in width, 0.25–0.80 mm wide, thick, the hairs few; corolla white, the tube narrowly salverform, to 12 mm long, ca. 0.5 mm wide in the middle, expanded toward the apex, thinly carnose, the hairs few, ascending, glabrous on both sides except puberulent toward the base within, the lobes 4, compressed hemispherical in bud, oblong, to 4 mm long, obtuse; stamens 4, the

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[130] *Rondeletia darcyi* Dwyer, spec. nov. *Frutices*? ramulis glabrescentibus. *Folia* oblongo-elliptica vel ovato-elliptica, 2–13 cm longa, 1.2–5.0 cm lata, acumine ad 2.5 cm longo, venis lateralibus ca. 6, rigido-membranacea supra glabra subtus ciliis debilibus saepe appressis; petiolis ad 0.5 cm longis; stipulis ca. 3 mm longis. *Inflorescentiae* cymoso-paniculatae, ad 5.5 cm longae, pedunculo ad 3.5 cm longo. *Flores* pedicellis ad 4 mm longis; lobis calycis angusto-oblongis, 2.3–4.2 mm longis, longitudine inaequalibus hic numquam uno duplo × longiori quam aliis, inaequalibus latitudine 0.25–0.80 mm; corolla alba tubo ad 12 mm longo, lobis 4, ad 4 mm longis; antheris ca. 3.2 mm longis; disco ovarii nullo, stylo 4.0–4.8 mm longo. *Fructus* non visi.

anthers oblong, ca. 3.2 mm long, obtuse, the filaments short, ca. 0.4 mm long, attached to the tube below the mouth; ovarian disc absent, the style slender, 4.0–4.8 mm long, glabrous except puberulent toward the apex, the stigmas 2, digitiform, 1–2 mm long, puberulent. *Fruits* not seen.

Rondeletia darcyi is known only from Panama. It is named in honor of William D'Arcy, student of the flora of Panama and one who assisted the author greatly in editing this treatment.

The most important diagnostic character of this new species is the unequal length of the calycine lobes. The longest lobe in the complex of 4 is not 2 times longer than the others but is quite variable. Four sets of lobe lengths, measured in millimeters, were discerned: a) 2.3, 2.6, 3.0, 4.2; b) 2.3, 2.5, 4.0, 4.0; c) 2.5, 2.6, 3.0, 3.6; d) 2.8, 3.0, 3.6, 3.8. The new species seems closely related to *R. secunda* Standley whose calycine lobes are twice as long as the other 3 lobes and are consistently wider than in *R. darcyi*. The new species has the stamens attached just below the corolla mouth rather than below the middle of the tube and the branches of the inflorescence are not helicoid.

COLÓN: Road bank just W of Portobelo, *D'Arcy 4079* (MO).

6. **Rondeletia darienensis** Standley, N. Amer. Fl. 32: 53. 1918. TYPE: Panama, *Pittier 4684* (US, holotype; F, isotype).

Shrubs?, the branchlets terete, webby tomentose. *Leaves* ovate to elliptic, 7.5–17.0 cm long, 2.5–7.0 cm wide, acuminate, basally cuneate or obtuse, the costa prominent beneath, the lateral veins prominent beneath, the blades arachnoid tomentose; petioles 0.3–2.0 cm long, tomentose; stipules ovate, ca. 0.8 mm long, the sheathing base 5–6 mm wide, adaxially glabrous, tomentose along the margin and sericeous in the center. *Inflorescences* axillary, thrysoid, 4–5 cm long, the peduncle 1.0–1.5 cm long, arachnoid tomentose; bracts 2, 3–4 mm long; bracteoles 1 or 2. *Flowers* with the pedicels to 1 cm long, white tomentose; hypanthium oblong, ca. 3 mm long, ca. 2 mm wide, the calycine lobes 4, lanceolate, 1.0–1.3 cm long, 0.2–0.4 cm wide, acute, glabrous within; corolla densely tomentose. *Fruits* capsular, ca. 4 mm long.

Rondeletia darienensis is known only from a single collection in Panama.

DARIÉN: Boca de Paurandó, on Sambú River, southern Darién, 20 m, *Pittier 4684* (F, US).

7. **Rondeletia hamelifolia** Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 144. 1967. TYPE: Panama, *Dwyer 1350* (MO, holotype; NY, isotype).

Shrubs or trees to 8 m tall, the branchlets terete, diffusely white pilose, the nodes often somewhat swollen. *Leaves* elliptic or elliptic rotund, 5–18 cm long, 2.3–6.0 cm wide, deltoid and widely acuminate at the apex, basally subcuneate, the blade somewhat decurrent on the petiole, the costa prominulous, the lateral veins 6–9, strongly arcuate ascending, prominulous beneath, stiffly papyraceous, discolorous, tending to dry gray green beneath, pilose above and beneath, the hairs above few, white, appressed, densely crowded on the veins; petioles occasionally absent, 0.2–2.0 cm long; stipules triangular, 4–10 mm long, 2–4 mm

wide, the cusp 2–5 mm long, sericeous inside and out, bearing several oblong glands within, these to 1 mm long, drying black. *Inflorescences* terminal, cymose paniculate, 4–13 cm long, to 10 cm wide, the peduncle 1–2 cm long, the primary branches paired, few, well spaced, 0.5–1.2 cm long, the branchlets ternately disposed above the middle of the branches, the cymules few flowered or often with the flowers solitary; bracts and bracteoles persistent, triangular subulate, golden pubescent. *Flowers* sessile or on pedicels to 3 mm long, golden pubescent; hypanthium rotund, ca. 2 mm long, densely golden pubescent, the calycine lobes 5, oblong or triangular subulate, subequal, ca. 1.5 mm long, obtuse at the apex; corolla white, the tube salverform, to 5 mm long, ca. 1 mm wide at the apex, yellow within, the mouth scarcely annular, thickened, the lobes 5, rotund, ca. 4 mm long, rounded or obtuse at the apex; stamens 5, the anthers linear oblong, ca. 2 mm long, the filaments short, attached near the middle of the tube. *Fruits* oblong rotund, to 0.8 cm long, loculicidally dehiscent, the ribs scarcely prominulous, puberulous.

Rondeletia hamelifolia is known only from Panama.

LOS SANTOS: Canofistulo, *Dwyer 2458* (MO). Los Asientos, *Wendehake 38* (MO). VERAGUAS: San Francisco near Río San Francisco, *Dwyer 1272* (MO). Santiago, *Dwyer 1350* (MO, NY). Santiago, 14 mi from Panamerican Highway toward Atalaya, *Dwyer & Kirkbride 7410* (GH, MO, US), *7422A* (MO). 2 mi W of Santiago on Panamerican Highway, *Dwyer et al. 7556* (GH, MO, US). Between Tolé and Santiago, *Kirkbride & Hayden 164* (MO). Alto Piedra, *Lao 471* (MO). Cañazas, *Tyson 3638* (MO; SCZ).

8. **Rondeletia kirkbridei** Dwyer.[131] TYPE: Panama, *Mori & Kallunki 6112* (MO, holotype).

Trees small, to 5 m tall, the branchlets angular, minutely pubescent, the nodes well spaced. *Leaves* ovate lanceolate, 10–16 cm long, 4.5–5.5 cm wide, often slightly inequilateral, attenuate apically, often deltoid or acute, acuminate, the acumen wide or narrow, to 2 cm long, acute to cuneate at the base, the costa prominulous above and beneath, the lateral veins 7–8, strongly arcuate, evanescent near the margin, the smaller veins often plane or immersed, papyraceous, concolorous, glabrate above, moderately puberulent on the costa and the veins; petioles to 2.5 cm long, to 0.2 cm wide, rigid, glabrescent; stipules connate, appressed to the stem or spreading, ovate triangular or triangular, to 0.7 cm long, the awn to 2 mm long, coriaceous, puberulent outside, within densely white villose. *Inflorescences* terminal, paniculate, 20–24 cm long, to 9 cm wide; peduncle 9–12 cm long, to 0.2 cm wide, minutely puberulent, the rachis with 6–8 pairs of branches, these opposite or subopposite, the lowermost branches to 2.5 cm long, angular, spreading. *Flowers* with the hypanthium oblong, ca. 2 mm long, puberulent, the calycine cup ca. 0.5 mm long, puberulent outside, with a minute gland in the interdental sinus, the lobes 4, subequal or unequal, the 3 shorter lobes triangular, 0.7–1.2 mm long, the fourth lobe oblong lanceolate, 2.5–4.5 mm

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[131] *Rondeletia kirkbridei* Dwyer, spec. nov. *Arbores* ad 5 m. *Folia* ovato-lanceolata, 10–16 cm longa, ad 5.5 cm lata, acumine ad 2 cm longo, venis lateralibus 7–8 subtus in costa venisque puberula; petiolis ad 2.5 cm longis, stipulis connatis ad 0.7 cm longis seta ad 2 mm longa. *Inflorescentiae* paniculatae 20–24 cm longae, ad 9 cm latae; pedunculo ad 12 cm longo. *Flores* cupula calycis ca. 0.5 mm longa, extus puberula lobis 4, 3 parvis ad 1.2 mm longis, uno magno 2.5–4.5 mm longo; corollae tubo ad 2 cm longo; antheris ca. 3 mm longis.

long, ca. 1.5 mm wide, venose; corolla pink or lavender, the tube infundibuliform, to 2 cm long, in the middle to 1.2 mm wide, puberulent outside, within glabrous above, puberulent below the middle, the lobes (3–)4, ovate oblong rotund, ca. 5 mm long, obtuse, glabrous; stamens 3–4, the anthers sessile, included, rectangular oblong, ca. 3 mm long, obtuse, attached at the middle of the anther; style linear, 6–8 mm long, the stigmas 2–4, linear oblong, 1.3–2.0 mm long. *Fruits* not seen.

Rondeletia kirkbridei is known only from Panama. It is named in honor of Joseph Kirkbride, Jr., an authority on the genus *Rondeletia*. While the new species is closely related to *R. cooperi* Standley, it is distinguished by its elongate pink or lavender corolla tube and stipules which are externally glabrate. It is also related to *R. skutchii* Standley, a red-flowered species in Guatemala which has few lateral veins in the leaves, a pendent inflorescence, and a much shorter corolla.

VERAGUAS: NW of Santa Fé, 1 km from Escuela, Cerro Tute, *Mori & Kallunki 4780* (MO). NW of Santa Fé, *Mori & Kallunki 4849* (MO). 16 km NW of Santa Fé, road to Calovébora, 300–500 m, *Mori & Kallunki 6112* (MO).

9. **Rondeletia odorata** Jacq., Enum. Pl. Carib. 16. 1762. TYPE: not seen.

9a. **Rondeletia odorata** Jacq. var. **breviflora** Hooker, Curtis Bot. Mag. *tab. 6350.* 1878. TYPE: not seen.

Shrubs, the branchlets terete, ultimately ferrugineous hirsute. *Leaves* ovate, obovate or elliptic, 1.7–5.0 cm long, 1–3 cm wide, acute at the apex, subcordate basally, the intervenal areas spreading reticulate, coriaceous, scabrous, bullate, sparsely hirsute beneath; petioles absent or to 0.2 cm long; stipules broadly deltoid, 2–4 mm long, 1.5–4.0 mm wide. *Inflorescences* terminal, narrowly thrysoid; peduncles 0.3–0.7 cm long; ferrugineous hirsute; basal bracts 2, foliar, 3–8 mm long, to 5 mm wide. *Flowers* pedicellate, the pedicels ca. 2 mm long, ferrugineous tomentose; calycine lobes 6, oblong, ca. 4 mm long, ca. 1 mm wide, glabrous within; corolla bright red, the tube 5–7 mm long, scarcely tomentose outside, glabrous within, the lobes 5, ca. 2.5 mm long, obtuse, the callosity at the mouth ringlike, ca. 0.4 mm thick, ca. 2 mm long; stamens 5, the anthers oblong, ca. 2 mm long, the filaments ca. 1 mm long, attached at the middle of the tube; stigmas 2–3, the style thick and glabrous. *Fruits* not seen.

Rondeletia odorata var. *breviflora* is known only from Panama. *Rondeletia odorata* Jacq. var. *odorata* is not found in Panama.

CANAL ZONE: Matachin to Las Cascadas, *Cowell 359* (NY).

10. **Rondeletia panamensis** DC., Prodr. 4: 408. 1830. TYPE: Panama, *Seemann* (BM, not seen; MO, photo).

Shrubs or trees to 6 m tall, the branchlets terete, white tomentose to glabrous. *Leaves* elliptic to subovate, 2–15 cm long, 1.3–7.0 cm wide, acute to subacuminate at the apex, attenuate basally, the lateral veins 6–9, strongly arcuate ascending, stiffly papyraceous to subcoriaceous, discolorous, the tertiary veins perpendicular; petioles scarcely measurable or to 1.2 cm long, white tomentose to

glabrate; stipules deltoid, 3–5 mm long, 2.0–6.5 cm wide, the cusp ca. 2 mm long, tomentose to glabrate. *Inflorescences* terminal, axillary, the peduncle to 4 mm long, the dichasia compound, tomentose to glabrate. *Flowers* pentamerous, pedicellate, the pedicels to 7 mm long; hypanthium small, rotund, ca. 2.5 mm long, truncate, white tomentose, the calycine cup ca. 1.5 mm long, the lobes 5, subulate, ca. 8 mm long, ca. 2.5 mm wide, petaloid, densely sericeous within at the base; corolla white, the tube 11–18 mm long, petaloid, villosulose outside, moderately so within except dense near the mouth, the latter with a ringlike callosity, the lobes 4, subrotund, ca. 5 mm in diam., 1 lobe ca. 3 mm in diam., anthers oblong, ca. 2 mm long, the filaments ca. 2 mm long; ovarian disc ringlike, ca. 3 mm deep, the style linear, ca. 8 mm long. *Fruits* rotund, to 1 cm in diam., sparsely tomentose, dehiscing loculicidally, the calycine lobes conspicuous, persistent.

Rondeletia panamensis extends from Panama to Colombia.

CANAL ZONE: Quebrada Fea, Quebrada Pura and Cañon of Río Chagres, *Dodge & Allen 17413* (MO). Road C-21, N of Corozal, *Dressler 3143* (MO). Albrook–Ft. of Clayton Dump Road, *Duke & Mussell 6622* (MO). Quarry Heights, *Dwyer 2607* (MO). Albrook Site, USATTC, *Dwyer 7123* (MO). Curundu, Thunder Hill, *McDaniel 5189* (MO). Balboa, *Standley 26996* (MO). Curundu, *Tyson & Blum 2526* (MO). Curundu Survival School, *Tyson & Dwyer 4464* (MO). Salamanca Hydrographic Station, Río Pequeni, *Woodson et al. 1562* (MO). DARIÉN: Chepigana, *Duke & Bristan 277* (MO). Vicinity of Piñas, *Duke 10626, 10654* (both MO). Puerto St. Dorothea, *Dwyer 2203, 2222, 2259* (all MO). Penas Bay near hotel, *Tyson 5520* (MO). PANAMÁ: Cerro Azul, *Carrera 8* (MO). Highway W of Chepo, *D'Arcy 6031* (MO). Cerro Azul, *D'Arcy & D'Arcy 6221* (MO). Jenine, *Duke 3843, 4482* (both MO). Río Charco-Espirito on Tocumen Highway, *Duke 5706* (MO). Río Mamoni, *Duke 5686* (MO). Cerro Azul, *Dwyer 1485* (MO). Río Pasiga, Waterfall, 2nd main fork, *Gentry 2284* (MO). Icantí, Río Agua Clara, *Gentry 2632* (MO). Between Goofy Lake and Panamerican Highway, *Gentry 6121* (MO). Between Chepo and El Llano, *Gentry 6455* (MO). Cerro Penon, 3 km S of Alcalde Diaz, 350–440 m, *Nee 8868* (MO). Between Chepo and La Capitana, *Tyson 6759* (MO). 1 mi E of El Llano, *Tyson 6839* (MO).

11. **Rondeletia platysepala** Standley, Ann. Missouri Bot. Gard. 27: 343. 1940. TYPE: Panama, *Allen 1791* (F, holotype; GH, MO, NY, isotypes).

Trees to 6 m tall, the branches with numerous branchlets, the twiglets slender, terete, smooth, puberulent. *Leaves* narrowly elliptic, 2.8–8.0 cm long, 0.7–2.2 cm wide, acute to deltoid at the apex, acuminate, the acumen to 1.5 cm long, ultimately acute, basally acute, the costa lightly prominulous above and beneath, the lateral veins 4–5, strongly arcuate, chartaceous, lustrous and sparsely tomentose to glabrescent above, glabrous to minutely farinose beneath except for small appressed hairs; petioles 1–3 mm long; stipules triangular, to 3 mm long, the cusp ca. 0.75 mm long with several digitiform processes ca. 0.5 mm long, drying black. *Inflorescences* terminal, cymose paniculate, puberulent, the peduncle 1–4 cm long, ca. 1 mm wide, slender, flexuous; bracts narrowly oblong or ovate oblong, to 3 mm long, acute, pubescent, deciduous. *Flowers* 4-merous, the pedicels absent or to 5 mm long; hypanthium oblong, ca. 1.5 mm long, tomentose, the calycine lobes equal elliptic, oblong elliptic or ovate elliptic, 1.5–4.2 mm long, to 2.5 mm wide, tomentose outside, glabrate within; corolla pale pink, the tube 7–11 mm long, tomentose outside, pubescent within below the middle; stamens included, the anthers oblong, 2 mm long, the filaments very short, attached near the middle of the tube. *Fruits* sessile, oblong or oblong rotund, to 0.6 cm long, 6-costate, glabrous, drying dark brown, the ribs thin,

white, woody, the intercostal area white venose, the 2 carpels septicidally dehiscent to base, each valve slightly loculicidally dehiscent, the calyx finally deciduous.

Folsom et al. 4711, juvenile and in mature fruit, seems to belong to *R. platysepala*. The sepals are equal in length, which supports this. The sepals of *Folsom 4711,* located only on the young fruit, are about twice the length of those found on the type collection, *Allen 1791*. The fruits seem much larger than those of *R. bertieroides* Standl., a species easily confused with *R. platysepala*.

Rondeletia platysepala is known only from Panama.

CHIRIQUÍ: Cerro Colorado, 1500–1750 m, *Folsom et al. 4711* (MO). COCLÉ: El Valle, North Rim, *Allen 1791* (F, GH, MO, NY).

12. **Rondeletia salicifolia** Dwyer & Hayden, Phytologia 15: 58. 1967. TYPE: Panama, *Tyson et al. 3319* (MO, holotype).—FIG. 85.

Trees 4–8 m tall, the branchlets terete, smooth, the hairs slender, golden, the nodes well spaced. *Leaves* lanceolate to elliptic, 3–20 cm long, 2–9 cm wide, the larger blades 3–4 times longer than wide, deltoid to subobtuse at the apex, acuminate, the acumen to 2 cm long, 0.15–0.2 cm wide at the middle, usually finally acute or subacute, basally cuneate to subobtuse, the costa prominulous to grooved above, subprominent beneath, convex, the lateral veins ca. 7, arcuate, prominulous, stiffly chartaceous, concolorous, drying chocolate brown, minutely golden puberulent, especially on the midvein and lateral veins; petioles moderately slender, 0.5–1.0 cm long; stipules deltoid to widely triangular, to 4 mm long, the terminal awn shorter than the body, arising from a ringlike thickening, curving arcuately, the body stiff, subcoriaceous, puberulent. *Inflorescences* terminal or axillary, paniculate; peduncle to 6 cm long, the branches cymose and occasionally secund, to 12 cm long, tomentose. *Flowers* sessile or shortly pedicellate, tomentose; hypanthium rotund, ca. 2 mm long, the calycine cup ca. 0.5 mm long, sparsely hairy outside, glabrous within, the lobes 4, with 1 lobe 3–4 times longer than the others, the larger lobe elliptic or ovate, 6–12 mm long, to 7 mm wide, acute, the remainder elliptic to deltoid, 0.7–3.5 mm long, to 3 mm wide, acute; corolla white, the tube 8–15 mm long, glabrous within, glabrate outside; anthers ca. 3 mm long, the filaments to 2 mm long; style much shorter than or equal to the corolla tube. *Fruits* rotund, to 4 mm in diam., costate, the hairs deciduous.

12a. **Rondeletia salicifolia** var. **salicifolia** is known only from Panama. There is a so-called type photo of *R. salicifolia* H.B.K. in the Missouri Botanical Garden; the original specimen is in the Herbier H&B in Paris, but this H.B.K. binomial is unpublished.

PANAMÁ: Cerro Jefe, *D'Arcy 3972* (MO). Finca Indio by Río Cascadas, *D'Arcy & D'Arcy 6232* (MO). Between Cerro Jefe and La Eneida, *Dwyer et al. 8215* (MO). Cerro Jefe, 3100 ft, *Dwyer & Gentry 9449* (MO). Cerro Azul to Cerro Jefe, *Foster 1139* (MO). Finca Indio, slopes of Cerro Jefe, *Gentry 2154* (MO). Cerro Jefe, *Gentry & Mori 13445* (MO). Cerro Jefe, 800 m, *Gomez-Pompa et al. 3069* (MO). 16 km above Panamerican Highway, road from El Llano to Cartí-Tupile, *Kennedy et al. 2432* (MO). Altos de Rio Pacora, 833 m, *Lewis et al. 2315* (MO). Finca Indio, slopes of Cerro Jefe, *Webster et al. 16478* (MO).

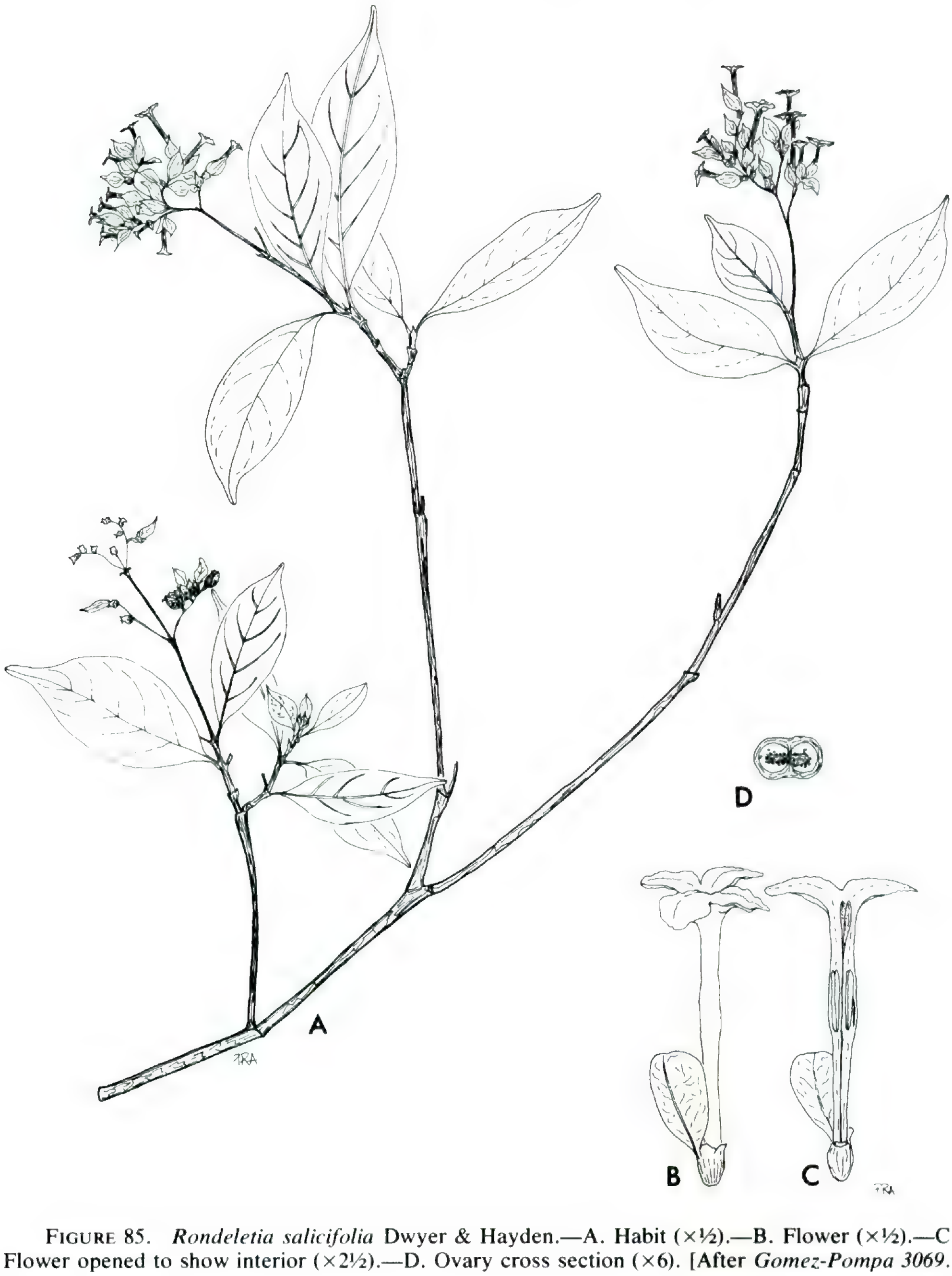

FIGURE 85. *Rondeletia salicifolia* Dwyer & Hayden.—A. Habit (×½).—B. Flower (×½).—C. Flower opened to show interior (×2½).—D. Ovary cross section (×6). [After *Gomez-Pompa 3069*.]

12b. **Rondeletia salicifolia** subsp. **brevicolla** Kirkbride, Ann. Missouri Bot. Gard. 55: 383. 1963. TYPE: Panama, *Kirkbride & Duke 597* (MO, holotype; NY, isotype).

Stipules with cusp 3.0–6.5 mm long; *leaves* sparsely tomentose on the veins beneath, the tertiary veins disposed at right angles to the lateral veins. *Flowers*

with the corolla tube ca. 8 mm long; septum of the ovary altogether connate, the placenta elliptic.

Rondeletia salicifolia subsp. *brevicolla* is known only from Panama.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 98* (F). Río Teribe between Quebrada Huron and Quebrada Schlunjik, 100 m, *Kirkbride & Duke 467* (MO, NY).

13. **Rondeletia secunda** Standley, Contr. U.S. Natl. Herb. 18: 141. 1916. TYPE: Panama, *Pittier 4279* (US, holotype; NY, isotype).

Shrubs, the branchlets terete, tomentose to glabrous. *Leaves* narrowly elliptic, rarely subovate, 7–16 cm long, 3–7 cm wide, often acuminate, the acumen to 1.7 cm long, basally rounded, truncate or acute, the lateral veins 7–8, arcuate, prominent beneath, stiffly chartaceous, concolorous, glabrate above and beneath, occasionally with sparsely distributed, weak, appressed hairs; petioles 1.6–6.0 mm long, glabrous to pubescent; stipules connate, the free portions triangular, 3–6 mm long, 2.0–3.5 mm wide, cuspidate, the cusp to 3.5 mm long. *Inflorescences* terminal, paniculate, the peduncles 4.0–6.5 cm long, the branches helicoid cymose, to 10 cm long, the flowers secund, well spaced. *Flowers* subsessile or with pedicels to 0.5 mm long, sparsely arachnoid tomentose; hypanthium rotund, ca. 1.5 mm in diam., sparsely arachnoid tomentose, the calycine cup to 0.3 mm long, the lobes 4, unequal, 1 lobe narrowly obovate, 3.6–7.5 mm long, 2 times the length of the other 3 lobes, the latter linear or narrowly oblong, 1.7–4.0 mm long, 0.2–0.6 mm wide; corolla white, the tube funnel shaped, 9–12 mm long, sparsely villose outside, the lobes 2–3 mm long, obtuse, papillate inside; ovarian disc ca. 0.1 mm long, glabrous. *Fruits* capsular, rotund, ca. 4 mm in diam., scarcely costate, glabrous, rugulose, the seeds rectangular, the calyx persistent.

Rondeletia secunda is known only from Panama. The fruits of *Dwyer 5138* are smaller than those of *Duke & Bristan 337* and *Duke et al. 3657*. It may be a different species: it alone of all the material cited was collected on the Pacific side of the Isthmus.

DARIÉN: Cocalito, *Dwyer 5138* (MO). SAN BLAS: Perme, *Cooper 229* (F, NY). E of Puerto Obaldia, *Croat 16919* (MO). Ailigandí River, *Duke & Bristan 337* (MO). Headwaters of Río Cuadi along river, *Duke et al. 3657* (MO). Near Puerto Obaldia, *Pittier 4279* (NY, US).

74. RUDGEA

Rudgea Salisbury, Trans. Linn. Soc. London 8: 327. 1807. TYPE: *R. lanceaefolia* Salisbury.

Strempelia A. Rich. ex DC., Prodr. 4: 498. 1830. TYPE: *S. guianensis* A. Rich. ex DC.

Shrubs, occasionally small trees. *Leaves* often coriaceous or subcoriaceous, petiolate or sessile; stipules interpetiolar, often with subulate or prickly teeth on the dorsal surface or on the margins, the margins occasionally laciniate. *Inflorescence* terminal, paniculate, cymose, umbellate or capitate, occasionally 1-flowered. *Flowers* with the calycine cup obsolete or obvious, the teeth present or absent; corolla salverform or funnelform, the lobes valvate; ovary 2-celled, the ovules connate, attached to a common basal column. *Fruits* baccate; seeds vertical, commonly only one present in the mature fruit.

Rudgea occurs throughout the American tropics and in the West Indies. It is a genus of about 150 species.

Literature:

Steyermark, J. 1967. *Rudgea*. Botany of the Guayana Highland—Part VII. Mem. New York Bot. Gard. 396–425.

a. Leaves sessile, at least some auriculate and/or amplexicaul at the base; largest blades to 4 cm wide ..... 1. *R. amplexicaulis*
aa. Leaves petiolate, not auriculate or amplexicaul; largest blades 4.5–10.0 cm wide.
  b. Largest leaf blades 5–11 cm long ..... 2. *R. chiriquiensis*
  bb. Largest leaf blades 12–22 cm long.
    c. Largest leaves 12–14 cm long.
      d. Fruits rotund, ca. 0.5 cm long.
        e. Leaves with 7–8 lateral veins; stipules ca. 0.3 cm long ..... 3. *R. cornifolia*
        ee. Leaves with 8–11 lateral veins; stipules ca. 1 cm long ..... 4. *R. coronicarpa*
      dd. Fruits oblong, 1 cm or more long ..... 5. *R. isthmensis*
    cc. Largest leaf blades 20–22 cm long.
      f. Leaves coriaceous; stipules to 1.5 cm long ..... 6. *R. pittieri*
        ff. Leaves chartaceous; stipules 0.6–0.9 cm long ..... 7. *R. skutchii*

1. **Rudgea amplexicaulis** Dwyer.[132] TYPE: Panama, *Croat 33133* (MO, holotype).

Scandent *shrubs* to 1.5 m tall, the branches terete, moderately slender, smooth, glabrous, the nodes well spaced, scarcely turgid. *Leaves* sessile, narrowly obovate oblong, 5–15 cm long, 2–4 cm wide, acute to deltoid at the apex, truncate at the base, at times vaguely auriculate and amplexicaul, the costa prominulous on both sides, the lateral veins arcuate, the undulate submarginal vein only to 3 mm from the margin, about 2 smaller veins between 2 lateral veins, arising at right angles from the costa and soon branching, the intervenal areas patulous reticulate, chartaceous, scarcely discolorous, glabrous; stipules deciduous, connate, cup shaped, to 1.5 mm long, scarious, scarcely swollen, glabrous with a few oblong glands, ca. 0.5 mm long. *Inflorescences* terminal, few flowered, glabrous, cymose paniculate, to 4 cm long, ca. 0.8 mm wide, the branches disposed as 2 well spaced, opposite pairs, each bearing one 3-flowered cymule; bracts patulous, ovate subulate, to 1.3 mm long. *Flowers* with the pedicels to 3 mm long; hypanthium oblong, ca. 2 mm long, glabrous, black when dry, the calycine cup ca. 1 mm long, the lobes triangular, to 0.35 mm long, acute, glabrous; corolla white, the tube narrowly cylindrical, scarcely attenuate basally, glabrous outside, the lobes 5, oblong, 5–6 mm long, minutely apiculate and vaguely cucullate. *Fruits* not seen.

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[132] *Rudgea amplexicaulis* Dwyer, spec. nov. *Frutices* scandentes ramulis glabris. *Folia* sessilia angusto-obovato-oblonga, 5–15 cm longa, 2–4 cm lata, basi truncata interdum modice auriculata et amplexicauli, chartacea vix discoloria glabra; stipulis deciduis connatis cupuliformibus hic ad 1.5 mm longis, vagina sine dentibus scariosa vix inflata glabra glandulis oblongis paucis, ca. 0.5 mm longis, ornata. *Inflorescentiae* terminales cymoso-paniculatae glabrae, ad 4 cm longae, pedunculo gracili, ad 1 cm longo, cymulis trifloris; bracteis patulis ovato-subulatis, ad 1.3 mm longis. *Flores* pedicellis ad 3 mm longis; hypanthio glabro cupula calycis ca. 1 mm longa, lobis 5 lato-triangularibus, ad 0.35 mm longis, glabris; corolla alba tubo cylindrico extus glabro, lobis 5, 5–6 mm longis. *Fructus* non visi.

Rudgea amplexicaulis is known only from Panama. It is immediately distinguished by its narrow leaves, some of which are amplexicaul at the base. The sprawling habit of the shrub is unique at least for the Central American species of *Rudgea*.

CHIRIQUÍ: Above San Félix along mining road 18–27 mi off Panamerican Highway above Chame or turnoff to Escopeta, 1200–1500 m, *Croat 33133* (MO).

2. **Rudgea chiriquiensis** Dwyer.[133] TYPE: Panama, *Croat 37017* (MO, holotype).

Shrubs to 4 m tall, the branchlets terete, glabrous, the nodes moderately turgid, well spaced. *Leaves* oblong, 5–11 cm long, 1.5–5.0 cm wide, acute to subobtuse at the apex, acuminate, the acumen often falcate, ultimately acute, the base acute to vaguely obtuse, slightly inequilateral, the costa and the veins above plane, scarcely prominulous beneath, the lateral veins 6–8, arcuate, the submarginal vein scarcely distinguishable, the intervenal areas patulous reticulate, thinly chartaceous, somewhat discolorous when dry, glabrous; petioles slender, to 1.5 cm long, ca. 0.1 cm wide, glabrous, often rigid; stipules perhaps connate basally, widely triangular or subhemispherical, to 3.5 mm long, the marginal or submarginal glands few, oblong, to 1 mm long, the sheath drying black. *Inflorescences* terminal, cymose paniculate, glabrous, 3–7 cm long, 2–10 cm wide, the peduncle slender, 1.0–1.2 cm long, with 3 branches arising at the apex of the peduncle, these arcuate or angular ascending, 1–4 cm long, each branch terminated by 3 short and spreading branchlets, the cymules 3-flowered; bracts subulate, to 2 mm long, the bracteoles ovate, to 1.2 mm long. *Flowers* sessile, the hypanthium ca. 1 mm long, black, glabrous, the calycine cup ca. 0.5 mm long, truncate, the margin undulate or with 5 widely triangular, scarcely measurable teeth; corolla (in bud) ca. 7 mm long. *Fruits* not seen.

Rudgea chiriquiensis is known only from Panama. It is distinguished by its small leaves and reduced stipules.

CHIRIQUÍ: Cerro Colorado, along road above San Félix, 29 km above bridge over Río San Félix, 7.9 km above turnoff to Escopeta, disturbed primary forest, 1500 m, *Croat 37071* (MO).

3. **Rudgea cornifolia** (H.B.K.) Standley, Field Mus. Publ. Bot. 432. 1931.—FIG. 86.

Psychotria cornifolia H.B.K., Nov. Gen. Sp. Pl. 3: 362. 1819. TYPE: Venezuela, *Humboldt & Bonpland 893* (P), not seen.
P. fimbriata Benth., Hook. London J. Bot. 3: 226. 1841. TYPE: British Guiana, *Schomburgk 51*, not seen.
Rudgea micrantha Muell.-Arg., Flora 69: 454. 1876. TYPE: Brazil, *Martius 3007* (Photo type from M at F).
R. ceratopetala Donnell Smith, Bot. Gazette 35: 3. 1903. TYPE: Guatemala, *Tuerckheim 7904* (F, holotype).
R. fimbriata (Benth.) Standley in Standley and Calderon, List Pl. Salvador., 274. 1920.

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[133] *Rudgea chiriquiensis* Dwyer, spec. nov. *Frutices* ad 4 m alti ramulis glabris. *Folia* oblonga, 5–11 cm longa, 1.5–5.0 cm lata, costa venisque supra planis venis lateralibus 6–8, tenui-chartacea glabra; petiolis ad 1.5 cm longis; stipulis fortasse connatis, ad 3.5 mm longis. *Inflorescentiae* terminales cymoso-paniculatae, ad 7 cm longae, ad 10 cm latae, cymulis 3-floribus; bracteis subulatis, ad 2 mm longis. *Flores* hypanthio ca. 1 mm longo, glabro, cupula calycis truncata margine undulato vel dentibus 5 minutis ornato.

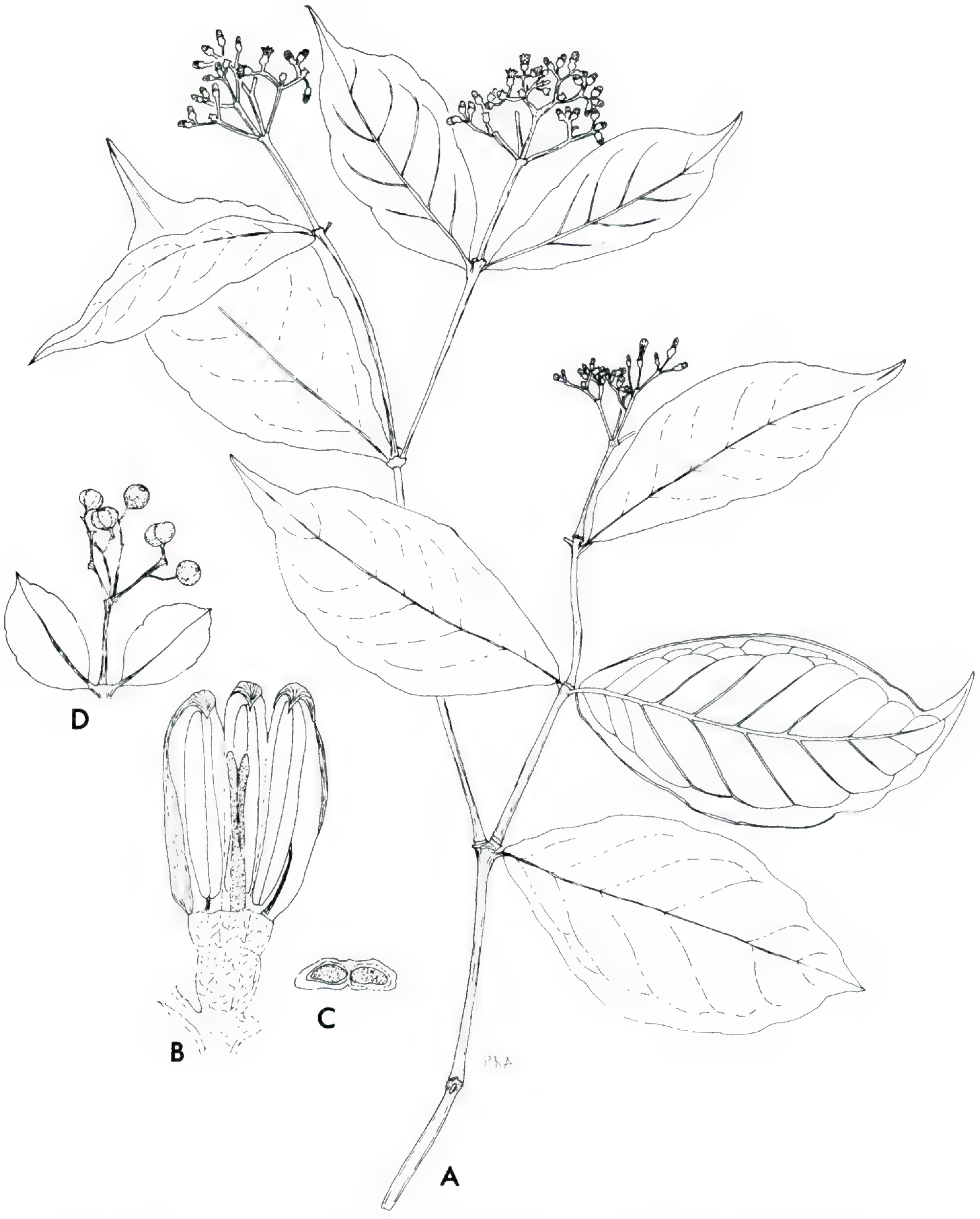

FIGURE 86. *Rudgea cornifolia* (H. B. K.) Standley.—A. Habit (×½).—B. Flower, part of perianth removed (×9½).—C. Ovary, cross section (×9½).—D. Fruit (×½). [After *Allen 288.*]

Strempelia ceratopetala (Donnell Smith) Brem., Recueil Trav. Bot. Néerl. 31: 303. 1934.
S. fimbriata (Benth.) Brem., Recueil Trav. Bot. Néerl. 31: 303. 1934.

Trees to 7 m tall, the branchlets slender, smooth, glabrous, nodose, the nodes well spaced. *Leaves* oblong to lanceolate, occasionally obovate, 8–14 cm long, to 7 cm wide, obtuse or rounded at the apex, occasionally subacute, acuminate, the acumen to 1.7 cm long, to 0.3 cm wide, obtuse to cuneate at the base, oc-

casionally vaguely auriculate, the costa slender, prominulous above and beneath, occasionally with pores (''domatia'') in the vein axils, the lateral veins 7–8, at first strict, then arcuate, joining adjacent veins to form an undulate submarginal vein to 1.5 cm from the margin, chartaceous, concolorous, glabrous; petioles absent or to 0.7 cm long, glabrous to minutely pubescent; stipules connate, compressed rectangular, to 3 mm long, truncate, subcoriaceous, glabrous, the margin thickened with ca. 6 triangular subulate lobes, to 0.75 mm long. *Inflorescences* terminal, solitary, glabrous, paniculate; peduncles 3.5–4.0 cm long, usually longer than the remainder of the inflorescence, either with 4 upright branches umbellately disposed and once ramose or the rachis with 2 pairs of opposite branches, to 2 cm long, dichotomous, each branchlet with a single few flowered cymule. *Flowers* glabrous; hypanthium oblong or rotund, the calycine cup cylindrical, ca. 2 mm long, carnose, the teeth as evanescent points; corolla white, to 7 mm long, the tube basally attenuate, the lobes 5, cucullate, longer than the tube; anthers 5, narrowly oblong, ca. 3 mm long, obtuse, dorsifixed, the filaments short; stigmas 2, capitate, the style narrowly cylindrical, thicker above the middle, the ovary wall and septum thick. *Fruits* white, rotund or compressed rotund, to 5.5 mm long, to 6.5 mm wide, smooth, glabrous, minutely farinose often vaguely 2-lobed, the calycine scar annular, ca. 1 mm in diam.

Rudgea cornifolia occurs in Middle America and in South America south to Bolivia.

BOCAS DEL TORO: Fish Creek Mts., *Wedel 2301* (US). Chiriquí Lagoon, *Wedel 2365* (US). CANAL ZONE: Frijoles, *Standley 27506, 27591* (both US). COLÓN: Santa Rita Ridge Road, ca. 8.5 km from Boyd-Roosevelt Highway, *Mori & Kallunki 2081* (MO). Santa Rita Ridge, 10 mi from Transisthmian Highway, *Porter et al. 4758* (MO, SCZ). DARIÉN: Pinogana and Yaviza, *Allen 288* (MO), *927* (US). El Real, *Duke 4836* (MO). Cerro Piriaque, *Duke 8085* (MO). Santa Fé, *Duke 8407, 10249, 10697, 10700, 14262, 14290* (all MO). Río Perecenico and Rancho Frio, *Duke & Elias 13878* (MO). Casí-Cana Trail, Cerro Campamento E of Tres Bocas, *Kirkbride & Duke 1221* (MO). N slope of Cerro Pirre, ca. 300–700 m, *Mori & Kallunki 5394, 5514* (both MO). El Real, *Stern et al. 120* (MO, US). Cerro Piriaque, *Tyson et al. 3840* (MO). Río Lara, *Tyson & Loftin 3851* (MO). Santa Fé, *Tyson et al. 4718* (MO). PANAMÁ: Cerro Jefe, *Dwyer et al. 7240* (MO, SCZ, US); *Dwyer & Gauger 7369* (GH, K, MO, UC, US). SAN BLAS: Río Diabolo and Río Asuati near Margana, *Duke 14872* (MO). 3–4 hour walk up Río Mulatupo, *Kirkbride 232* (MO). El Llano-Cartí Road, 24.5–25.0 km from Interamerican Highway, *Mori & Kallunki 5530* (MO).

4. **Rudgea coronicarpa** Dwyer.[134] TYPE: Panama, *Gentry & Dwyer 3647* (MO, holotype).

Small *trees* or shrubs, the twiglets angular, smooth, glabrous, the nodes well spaced but crowded at the very tips of the twigs. *Leaves* oblong or obovate oblong, 12–18.5 cm long, 4.5–10 cm wide, obtuse or widely deltoid at the apex, with a conspicuous acumen, to 1.5 cm long, often falcate, ultimately subacute, basally obtuse, truncate or scarcely auriculate, occasionally the blade constricted on lower ⅓, the costa prominulous above, prominent beneath, the lateral veins 8–11, arcuate, subprominent beneath, drying somewhat rubescent, the intervenal

[134] *Rudgea coronicarpa* Dwyer, spec. nov. *Arbores* parvae, ramulis glabris. *Folia* oblonga vel obovato-oblonga, 12–18.5 cm longa, 4.5–10 cm lata, venis lateralibus 8–11, rigido-chartacea; petiolis nullis vel ad 0.5 cm longis; stipulis liberis oblongis, ad 1 cm longis, obtusis calloso-fimbriatis fimbriis crebris ad 0.4 mm longis. *Inflorescentiae* ad 8.5 cm longae; pedunculo 4.0–5.5 cm longo, ramis 1–2 arcuato-ascendentibus unilateraliter dispositis. *Fructus* oblongi vel rotundi, ad 0.9 cm longi.

areas spreading reticulate, stiffly chartaceous, glabrous, the margin somewhat thickened; petioles obsolete or to 0.5 cm long, thick, to 2.5 mm wide, glabrous; stipules free, persistent only apically, erect, oblong, to 1 cm long, ca. 0.4 cm wide, obtuse, callose fimbriate at the apex, the fimbriae crowded, to 0.4 mm long, coriaceous, glabrous. *Inflorescences* terminal, glabrous, to 8.5 cm long; peduncles 4.0–5.5 cm long, slender, ca. 0.3 cm wide, angular, glabrous, dark green when dry, the peduncle terminated by 1–2 arcuate, ascending branches, the latter unilaterally disposed, each terminated by a sessile or subsessile fruit (flowers not seen), or with pedicels to 3 mm long, the one or two fruits arising below the terminal flower on slender, glabrous pedicels to 1.4 cm long. *Fruits* sessile or on slender pedicels to 1.4 cm long, oblong or rotund, at maturity to 0.9 cm long including the persistent calyx, smooth, glabrous, minutely farinose, the persistent calyx absent or to ¼ the length of the fruit.

Rudgea coronicarpa is known only from Panama. It is related to *R. cornifolia* but it has much larger stipules and a larger fruit.

COCLÉ: Lumber camp at Alto Calvario, 7 km N of El Cope, *Folsom 1309* (MO). Cerro Pilon, ca. 2700 ft, *Gentry & Dwyer 3647* (MO).

5. **Rudgea isthmensis** Standley, Ann. Missouri Bot. Gard. 26: 313. 1929. TYPE: Panama, *Woodson et al. 1618* (MO, NY, isotypes).

Trees to 4 m tall, the branchlets slender, the nodes well spaced. *Leaves* lance oblong, 5–13 cm long, 1.5–7.5 cm wide, deltoid at the apex, acuminate, the acumen usually falcate, cuneate basally, the lateral veins 6–8, the submarginal vein ca. 1 cm from the margin, stiffly papyraceous, drying yellow, glabrous; petioles slender, to 1.3 cm long, glabrous; stipules ca. 1 cm long. *Inflorescence* cymose paniculate, glabrous, to 3.5 cm long, much shorter than the terminal leaves, pedunculate, the rachis with 2 sets of widely divergent opposite or whorled branches. *Flowers* not seen. *Fruits* subsessile, large, oblong, to 1 cm long, rounded at the apex and base, sulcate, glabrous.

Rudgea isthmensis is known only from Panama.

CANAL ZONE: Salmanca Hydrographic Station, Río Providencia and ridge S of river, *Gentry & Nee 8699* (MO). Fort Sherman, *Tyson & Dwyer 1191* (MO). Pequení, *Woodson et al. 1618* (F, MO, NY). SAN BLAS: Between Río Diabolo and Río Acuati near Nargana, *Duke 14882* (MO).

6. **Rudgea pittieri** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 211. 1940. TYPE: Panama, *Pittier 3855* (F, holotype, US).—FIG. 87.

Shrubs 5–8 m tall, the branchlets 4-angled, ashen gray when dry, the nodes conspicuous, swollen, the internodes to 2 cm long. *Leaves* widely oblong or rotund, 13–22 cm long, 5.0–10.5 cm wide, deltoid or rotund toward the apex, the acumen absent or when present to 0.5 cm long, attenuate acute at the base, the costa prominulous above, prominent beneath, to 1.3 mm wide proximally, the lateral veins 10–12, arcuate, somewhat prominulous, the margin revolute, coriaceous, concolorous, shiny, glabrous; petioles thick, 1.5–3.0 cm long, to 0.25 cm wide; stipules free, compressed rotund, to 1.5 cm long, thick, coriaceous, glabrous, with an elevated rectangular portion extending beyond the body, rounded

FIGURE 87. *Rudgea pittieri* Standley. Habit (×½). [After *Porter 4803*.]

at the apex, and bearing 6–12 oblong glandular fimbriae to 2.5 mm long. *Inflorescences* terminal, solitary, the flowers congested into a rotund mass, to 3 cm in diam., sessile or the peduncle to 1.3 cm long, to 0.45 cm wide; external bracts ovate oblong, ca. 1.5 cm long, acute, glabrous, stiffly carnose, dark brown, the interior bracts similar but narrowly lanceolate. *Flowers* with the hypanthium short, the calycine cup short, the margin with 5 irregular, scariose, erose, triangular teeth, 0.5–2.5 mm long; corolla white, the tube cylindrical, ca. 1 cm long, thickly petaloid, glabrous outside, glabrous within except for the throat, the hairs

dense, the lobes 5, narrowly oblong, ca. 8 mm long, acute or obtuse, cucullate; stamens 5, the anthers oblong, 1.8 mm long, the filaments short; style linear, 15 mm long, the stigmas 2, 1 mm long. *Fruits* sessile, oblong, to 1.5 cm long, subtruncate or rotund, orange, black when dry, smooth, glabrous, often marcescent.

Rudgea pittieri is known from Panama and Colombia (Choco). Standley's original description was based on poor material, although foliage and stipule characters are enough to suggest the genus *Rudgea* and are diagnostic at the species level. In some ways the plant resembles a *Cephaelis* but the character of its stipules precludes that genus. The thick coriaceous leaves are unlike those of any *Rudgea* of Middle America.

CANAL ZONE: Near Maru Towers NW part of Canal Zone, *Johnston 1553* (MO). Santa Rita lumber road, 15 km E of Colón, *Dressler 3801* (MO). COLÓN: Tres Brazos sawmill, Icacal between Salud and Bocas de Rio Indio, *Howell 88* (MO). Santa Rita Ridge, ca. 10 mi from the Interamerican Highway, *Porter et al. 4803* (MO). Achiote, *Tyson et al. 4537* (MO); *Tyson 4532* (MO). PANAMÁ: El Llano-Cartí Road, 7–18 km from Interamerican Highway, *Correa et al. 1857* (MO); *Croat 25125* (MO); *Folsom 2556* (MO). W of El Llano, 4.8 mi N of highway, *Gentry 5102* (MO). Cerro Jefe, 18.2 km E of Goofy Lake, 800–900 m, *Gentry & Mori 13427* (MO). El Llano-Cartí Road, 16–18½ km N of Panamerican Highway, *Nee & Tyson 11000, 10955* (both MO).

7. **Rudgea skutchii** Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1374. 1938. TYPE: Costa Rica, *Skutch 2836* (F, holotype; isotypes NY, US).

Trees 2–5 m tall, the branchlets smooth, lustrous, glabrous, the nodes well spaced. *Leaves* oblong to obovate oblong, occasionally salicoid, 8.5–20.0 cm long, 3–10 cm wide, obtuse or rounded at the apex or occasionally truncate, the acumen narrowly deltoid, conspicuously falcate, to 2 cm long, to 0.25 cm wide in the middle, ultimately acute or obtuse, apiculate, the apiculum occasionally to 0.3 mm long, obtuse, rounded or truncate at the base, occasionally vaguely auriculate, subequilateral, the costa plane to prominent above, to 0.2 cm wide, the lateral veins 7–9, arcuate, the larger veins to 2.5 cm apart, prominulous above and beneath, the intervenal areas reticulate, chartaceous to papyraceous, scarcely discolorous, often with minute subepidermal raphides above, glabrous beneath; petioles 0.3–0.8 cm long, ca. 0.3 cm wide, minutely puberulent; stipules free, appressed, oblong or rotund, 0.6–0.9 cm long, about as long as wide, obtuse with about 25 crassate, linear oblong, fimbriate excrescences at apex, these to 1 mm long, glabrous. *Inflorescences* terminal, solitary, glabrous, cymose paniculate, to 6 cm long, to 6 cm wide, the peduncle to 4.5 cm long, 0.1 cm wide, glabrous, often slightly curved, angular, the primary branches 2–3, to 1.5 cm long, the cymules few, 3-flowered. *Flowers* sessile or pedicellate, the median flower sessile, the lateral flowers on pedicels to 1 cm long, glabrous, the floral parts glabrous, the hypanthium obconic, ca. 2 mm long, the calycine cup to 5 mm long, truncate or with 5 widely triangular teeth, to 0.4 mm long, the margin scarious; corolla white, the tube cylindrical, to 7 mm long, stiffly carnose, the lobes 5, narrowly oblong, 7–8 mm long, with a subapical adaxial projection, narrowly oblong, ca. 2 mm long, the stamens 5, the tips of anthers barely exserted, the anthers narrowly oblong, to 3.5 mm long, obtuse, the filaments short, inserted in the upper ⅔ of the tube, the stigmas included in tube, the style slender, the stigmas erect (at least in bud), subulate. *Fruits* not seen.

Rudgea skutchii is restricted to Costa Rica and Panama and Choco, Colombia. It resembles *Rudgea killipii* Standley from Colombia (holotype *Killip & Smith 15246* [US]). While the inflorescences and calycine cups of the two species are strikingly similar, the leaves of *R. killipii* are scarcely acuminate in contrast to those of *R. skutchii*. Croat points out (*27207*) that the flowers are "sweetly aromatic."

BOCAS DEL TORO: Río Tuquesa ca. 2 km by air from Continental Divide, near Tyler Kittredge gold mining camp, *Croat 27187, 27209* (both MO). Forest above railroad stop at Milla 7.5, *Croat & Porter 16271* (MO). Punta Pena, near Chiriquicito, *Lewis et al. 2143* (COL, MO, UC, VEN), *2166* (MO, UC). COCLÉ: La Mesa near El Valle, *Allen 2699* (MO). N of El Cope, 500 m, *D'Arcy 11302* (MO). Rivera sawmill, 600–800 m, *Folsom 3149* (MO). PANAMÁ: Cerro Campana, *Dressler 4127* (MO).

75. RUSTIA

Rustia Klotzsch in Hayne, Arzn. Gew. 14: *pl. 14*. 1846. LECTOTYPE: *R. formosa* (Cham. & Schlecht.) Kl. (*Exostem(m)a formosum* Cham. & Schlecht.).

Trees or shrubs, the branchlets glabrous. *Leaves* glandular punctate; stipules large, deciduous. *Inflorescences* terminal, paniculate. *Flowers* pedicellate, the pedicels bracteolate; hypanthium campanulate or turbinate, the calycine cup with 5 lobes or teeth; corolla funnelform or campanulate, the tube glabrous to hairy within, the lobes 5, valvate; stamens 5, the anthers basifixed, opening by a terminal slit or pore, the filaments attached at the throat; ovarian disc terete or sulcate, the style dilated medially, clavate at the apex or the 2 stigmatic lobes conspicuous, the ovary 2-celled, the ovules numerous, attached vertically to the septum. *Fruits* capsular, coriaceous, oblong ovoid, the 2 valves separating loculicidally; seeds numerous, minute, horizontal, the testa membranous.

Rustia, a genus of about 15 species, ranges from Mexico, Central America to South America. It also occurs in the West Indies. From a floral viewpoint it is the easiest genus to recognize among the Panamanian Rubiaceae, as the anthers open by terminal pores. The pellucid-punctate leaves are also unique.

Literature:

Simpson, D. 1976. Studies in Neotropical Rubiaceae. 1. *Rustia*. Phytologia 33: 4.

a. Largest leaves not exceeding 9 cm in width; corolla purple or red; fruits ca. 10 mm long ..... 1. *R. occidentalis*
aa. Largest leaves 20–19 cm wide; corolla white; fruits ca. 5 mm long ..... 2. *R. panamensis*

1. **Rustia occidentalis** (Benth.) Hemsl., Biol. Centr. Amer. 2: 14. 1881.

Exostemma occidentale Benth., Bot. Voy. Sulphur 104. 1844. TYPE: Panama, *Barclay* and/or *Hinds* (K, holotype).

Shrubs or small trees, to 5 m tall; branchlets terete, smooth, rimose, often cracking, glabrous. *Leaves* narrowly oblong to obovate oblong, often falcate, regularly 3 times longer than wide, to 22 cm long, to 9 cm wide, acute or deltoid at the apex, acuminate, the acumen to 3 cm long, usually falcate, basally acute,

the costa plane or slightly depressed above, prominent beneath, the lateral veins ca. 15, arcuate, those in the middle of the blade 1.0–2.5 cm apart, stiffly papyraceous, scarcely discolorous, the intervenal areas with scattered glandular punctations, glabrous; petioles slender, to 4 cm long, to 0.2 cm wide, usually angular, the lamina decurrent alate, glabrous; stipules not seen. *Inflorescences* terminal, solitary, paniculate, occasionally racemiform, shorter than the uppermost leaves, the peduncle absent or 0.5–2.0 cm long, the lateral branches short or to 6.5 cm long, angular, opposite (at least the 2 lowermost pairs), the flowers solitary on reduced ultimate branchlets or in spreading cymules on the upper ½ of the branchlets. *Flowers* with the hypanthium cuneate, to 5 mm long, ca. 2.5 mm wide, glabrous, the calycine cup ca. 0.5 mm long, the margin erose, toothless or with 5 vague, undulate areas; corolla purple or red, the tube compressed cylindrical, ca. 7.5 mm long, ca. 3 mm wide at the base, slightly constricted medially, stiffly carnose to coriaceous, glabrous except densely white villose at the filament attachment point, the lobes 4, oblong, slightly shorter than the tube, acute or obtuse, glabrous; stamens 5, the anthers oblong, ca. 6.8 mm long, ca. 2 mm wide, obtuse and porocidal at the apex, obtuse basally, dorsifixed near the base, the filaments short, ca. 0.8 mm broad; stigmas 2, erect, concave adaxially, ca. 1 mm long, the style cylindrical, ca. 0.9 mm long, ca. 0.7 mm broad, constricted basally. *Fruits* briefly pedicellate, capsular, obovoid, ca. 1 cm long, to 0.8 cm wide, truncate at the apex with an annular scar, drying dark brown, thin but lignose, delicately longitudinal striate, glandular punctate, splitting to base into 2 valves, each with a conspicuous, median, longitudinal, seminiferous septum.

Rustia occidentalis ranges from Costa Rica to Colombia. The fact that the flowers are purple red, the leaves pellucid punctate, and the anthers open by a terminal pore allows for ready identification of the species. Simpson (1976) recently treated the genus *Rustia* as found in Colombia, Ecuador, and Peru. He noted *R. occidentalis* for Colombia, but he did not mention the Central American distribution of the species.

PANAMÁ: BOCAS DEL TORO: Old Bank Island, *Wedel 298* (F). CANAL ZONE: Mojinga Swamp, mouth of Río Chagres, *Allen 860* (MO). Chagres, *Fendler 289* (F, MO). Chagres River, 1 mi above mouth, *Johnston 1745* (MO). COLÓN: Miguel de la Borda, *Croat 9828* (MO). Along Caño Rey, vicinity of Cocle del Norte, *Dressler 4207* (MO). DARIÉN: Piñas, *Duke 10576, 10605* (both MO). Puerto St. Dorothea, *Dwyer 2231* (MO), *2290* (F, MO). COLOMBIA: 3–7 mi S of Curice, *Duke 9653* (MO).

2. **Rustia panamensis** Dwyer.[135] TYPE: Panama, *Croat 27508* (MO, holotype).—FIG. 88.

Trees to 12 m tall, the branchlets terete, smooth, glabrous, the scars at the nodes conspicuous, the nodes well spaces. *Leaves* oblong or obovate oblong, occasionally falcate, 15–45 cm long, 10–19 cm wide, the costa prominulous above, prominent beneath, the lateral veins ca. 15, at first strict then arcuate toward the

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[135] *Rustia panamensis* Dwyer, spec. nov. *Arbores* ramulis glabris. *Folia* oblonga, 15–45 cm longa, venis lateralibus ca. 15, rigido-papyracea pellucido-punctata; petiolis ad 6 cm longis. *Inflorescentiae* cymoso-paniculatae, ad 45 cm longae, ad 26 cm latae. *Flores* sessiles; calyce dentibus nullis; corolla tubo 0.4–1.0 cm longo, extus glabro; antheris ad 2 mm longis poro dehiscentibus, filamentis ad 1.2 mm longis. *Fructus* subrotundi vel oblongo-rotundi, ad 0.5 cm longi, glabri; seminibus ad 0.8 mm longis.

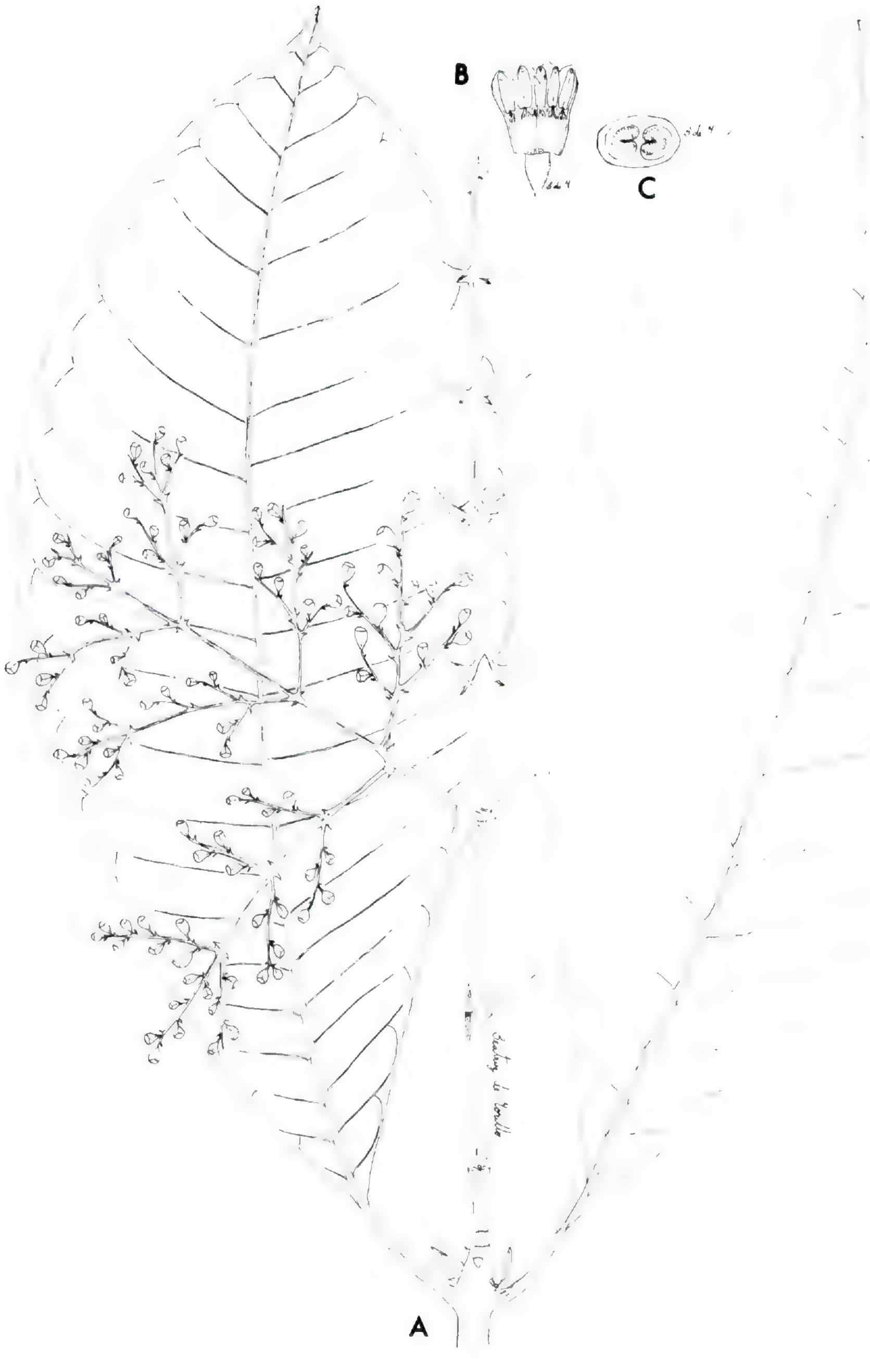

FIGURE 88. *Rustia panamensis* Dwyer.—A. Inflorescence (×$^{2}/_{5}$).—B. Flower opened to show interior (×$^{4}/_{5}$).—C. Ovary cross section (×$1^{1}/_{5}$). [After *Busey 464*.]

margin, prominulous beneath, the veinlets irregularly pinnatiform, stiffly papyraceous, glabrate or glabrous, pellucid punctate under magnification; petioles to 6 cm long, expanded toward the base, abaxially concave, lignose, glabrous; stipules not seen. *Inflorescences* terminal, solitary or 2–3, cymose paniculate, spreading, puberulent, to 26 cm long, to 20 cm wide, often with 3 strongly as-

cending branches terminating the peduncle, these 3.0–4.5 cm long, angular, glabrous, the uppermost branches opposite, well spaced, rigidly patulous or deflexed, simple or often with short branches, the flowers well spaced, the lowermost bracts deciduous, triangular, to 1.8 cm long, to 0.7 cm wide at the base, elongate attenuate, acuminate toward the apex, rigid, glabrous, the uppermost bracts subulate. *Flowers* sessile, the hypanthium oblong rotund, glabrous, the calycine cup short, to 0.5 cm long, scarious, petaloid, glabrous and eglandular within, the margin undulate, the lobes virtually absent; corolla white, the tube short, cylindrical, somewhat constricted at the middle, to 10 mm long, to 1.5 mm wide, thickly petaloid, glabrous on the outside and within except near insertion of the filaments, the lobes 4(–5)–6; ovate lanceolate, upright (at least in bud) to 2 mm long, yellow brown; stamens 5, wholly or in part exserted, the anthers oblong, to 2 mm long, dehiscent by a terminal pore, the filaments short, to 1.2 mm long, expanded at attachment point; disc of the ovary strongly compressed rotund, ca. 0.6 mm long, the style to 4 mm long, the stigmas 2, exserted, widely oblong, concave. *Fruits* scarcely pedicellate, subrotund to oblong rotund, to 0.5 cm long, glabrous, drying purple black, marcescent, lightly venose; seeds compressed, falcately fusiform, rhomboid fusiform, ca. 0.8 mm long, shiny, reticulate.

Rustia panamensis is known only from Panama. Its pellucid-punctate leaves and porocidally dehiscent anthers immediately distinguish it as a *Rustia*. The large paniculate inflorescence, extraordinarily large leaves, and very reduced fruits distinguish it from *R. occidentalis* Hemsley. The variation in the number of stamens (4–6) is noteworthy.

CHIRIQUÍ: San Bartolo Limite, 21 km WNW of Puerto Armuelles, *Busey 464* (MO). Burica Peninsula, San Bartolo Limite, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22191* (MO). PANAMÁ: El Llano-Carti Highway, 10–12 km N of El Llano, *Dressler 4749* (MO). VERAGUAS: Valley of Río Dos Bocas, 11 km from Escuela Agricola Alto Piedra, 450 m, *Croat 27508, 27551* (both MO). Atlantic slope N of Santa Fe, 11 km from Escuela Agricola Alto Piedra, *Mori & Kallunki 3086* (MO). NW of Santa Fe, 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3086* (MO).

76. SABICEA

Sabicea Aublet, Hist. Pl. Guiane 1: 192. 1775. TYPE: *S. aspera* Aubl.

Climbing *shrubs*. *Inflorescences* axillary, sessile or pedunculate, the flowers disposed in bracteate heads or in corymbose or umbellate cymes. *Flowers* with the hypanthium somewhat ellipsoid, the lobes 3–6, linear or oblong; corolla usually funnel shaped, the lobes 4–5, shorter than the tube, valvate in bud; stamens 4–5, usually included, the anthers dorsifixed, inserted in the tube or in the throat of the corolla; style usually included, the stigmas 4–5, linear; ovules numerous on axile placentae. *Fruits* fleshy or leathery, 4–5-celled; seeds numerous, minute.

Sabicea, a genus of about 125 species, is found in tropical America, Africa, and Madagascar.

Literature:

Wernham, H. F. 1914. A Monograph of the genus *Sabicea*, 1–82.

a. Calycine lobes 2–4 mm long; stipules 3–6(–7) mm long.
  b. Stems and leaves with hairs closely appressed.
    c. Inflorescences short pedunculate ..... 1. *S. panamensis*
    cc. Inflorescences sessile ..... 2b. *S. villosa* var. *adpressa*
  bb. Stems and leaves with hairs spreading ..... 2a. *S. villosa* var. *villosa*
aa. Calycine lobes 3–6 mm long; stipules ca. 8 mm long ..... 3. *S. stellaris*

1. **Sabicea panamensis** Wernham, Monogr. *Sabicea* 30. 1914. TYPE: Panama, *Fendler 181* (K, holotype).—FIG. 89.

S. costaricensis Wernham, Monogr. *Sabicea* 31. 1914. SYNTYPES: Costa Rica, *Pittier 6712, 2904* (both BM).

Shrubs or sprawling woody *vines*, the stems terete, densely pubescent, the nodes well spaced. *Leaves* elliptic, 7–13 cm long, 3.0–5.5 cm wide, deltoid, rarely obtuse at the apex, often contracted and short acuminate, the acumen widely triangular, cuneate to occasionally obtuse at the base, the costa prominulous above and beneath, the lateral veins 10–14, arcuate, chartaceous, often stiffly so, not strongly discolorous above, the hairs in the intervenal areas stigillose, well spaced or absent, those on the costa and veins stiff, appressed, dense, the hairs in the intervenal areas beneath sometimes shorter than above, the costa and the veins with elongate, appressed hairs; petioles to 2 cm long, to 0.15 cm wide, densely hairy; stipules free, ovate rotund, rotund or compressed rotund, to 7 mm long, often as wide as long at the base, drying red, reflexed, strigose outside, glabrous within. *Inflorescences* axillary, the peduncle 0.5–1.5(–3.5) cm long, the flowers congested; bracteoles narrowly oblong. *Flowers* pedicellate, the pedicels slender, 0.3–1.0 cm long; hypanthium densely appressed golden hairy, the calycine cup short, the lobes 5, equal or unequal, narrowly ovate, to 4 mm long, the longest often exceeding the hypanthium in length, usually reflexed, glabrescent within; corolla white or yellow, occasionally red or purple pink, often turning brown with age, the tube narrowly funnel shaped or cylindrical, 5–6 mm long, ca. 1 mm wide in the middle, the hairs outside similar to those of the hypanthium, glabrous within, the lobes 5, subulate or narrowly triangular, equal or subequal, to 2.5 mm long; stamens 5, the anthers sessile or subsessile, oblong, ca. 2 mm long, attached above the middle of the tube; style linear, 2–10 mm long, the stigmas 2, each about as wide as the style, to 1 mm long. *Fruits* pedicellate, rotund to oblong, 0.5–0.9 cm in diam., pink or red at maturity, the hairs weak, elongate, well spaced, appressed strigose.

Sabicea panamensis extends from Guatemala to Colombia. *Mori & Kallunki 5603* point out that the flowers are visited by skippers; *Duke 9368* indicates that flowers are visited by hummingbirds. *Mori & Kallunki 2063* remark that "freshly cut twigs smell like peppermint."

BOCAS DEL TORO: Santa Catalina, *Blackwell et al. 2742* (MO). Old Bank Island, *Wedel 1916, 1975* (both MO). Little Bocas, *Wedel 2558* (MO). Big Bight, *Wedel 2889* (MO). CANAL ZONE: Pipeline Road near Gamboa, *Clewell & Tyson 3320* (MO). Hill C-6, Ft. Sherman, *Duke 4395* (MO). Coco Solo, *Dwyer & Duke 7895* (MO, UC). Chagres, *Fendler 181* (MO). Pipeline Road, *Hayden 71* (MO). NW shore of Gatún Lake, *Lewis et al. 1831* (GH, MO). Pipeline Road, *Lewis et al. 5465* (MO, SCZ); *Mori & Kallunki 2063* (MO). Navy Reservation N of Gamboa, *Robyns 65-49* (MO). Fort Sherman, Pena Road, *Tyson & Chu 1704* (MO). CHIRIQUÍ: 17 km NE of San Félix, 1000 m, *Nee 10668* (MO). COCLÉ: Cerro Pilón, 700–900 m, *Duke 12109* (MO). El Valle to La Mesa, *Dwyer et al. 585* (MO). El Valle, *Dwyer 1945, 1946* (both MO); *Dwyer & Correa 7987* (COL, DUKE, K, MO, UC, VEN). 7 km

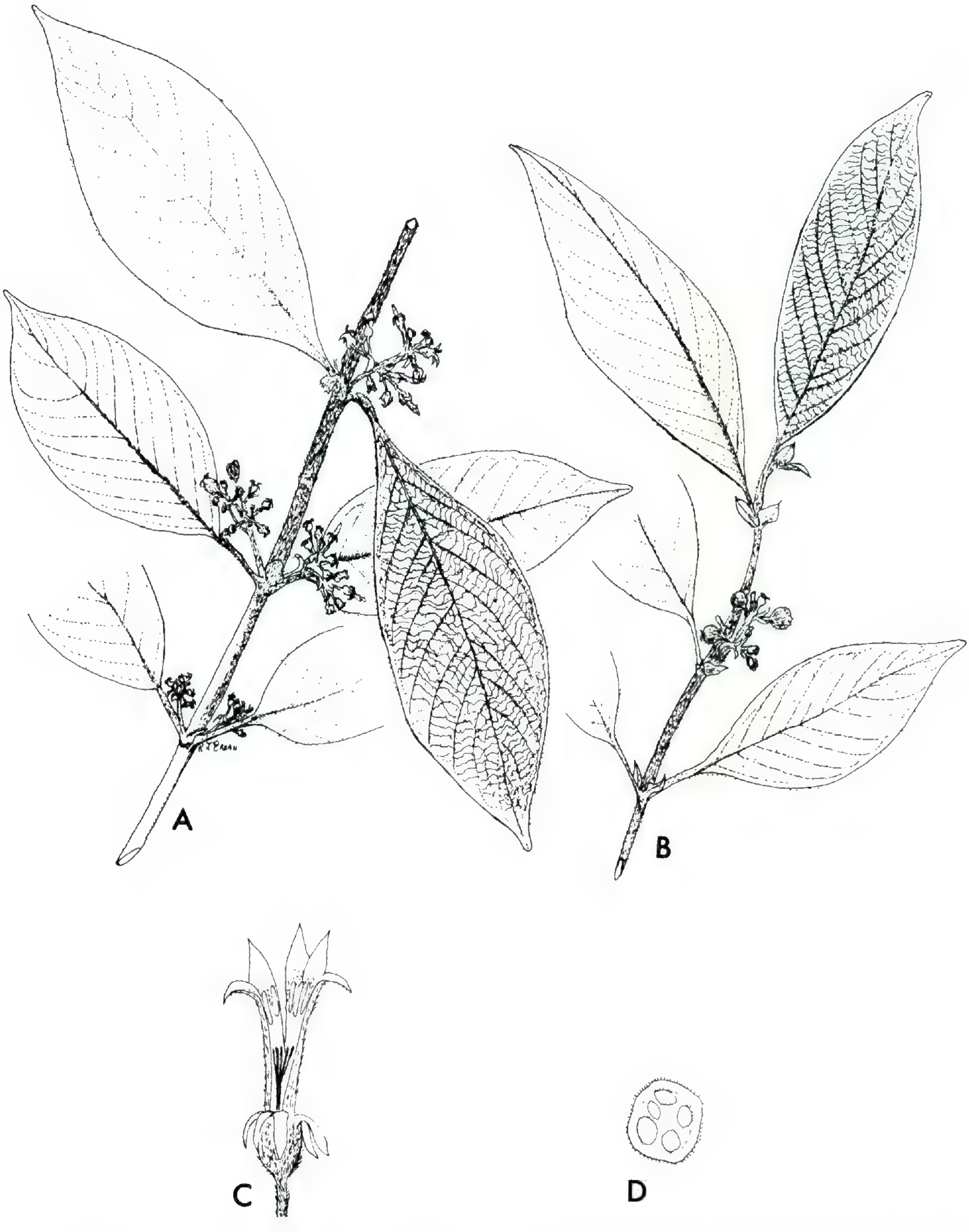

FIGURE 89. *Sabicea panamensis* Wernham.—A. Flowering branch (×½).—B. Fruiting branch (×½). [After *Oliver et al. 2674.*]—C. Flower opened to show interior (×2½).—D. Young fruit and seeds, cross section (×2½). [After *D'Arcy & D'Arcy 6244.*]

N of El Cope, 900 m, *Folsom 1337* (MO). La Mesa, *Folsom 3650* (MO). La Mesa, El Valle de Anton, *Folsom & Butcher 3818* (MO). Summit of Alto Calvario, 900 m, *Folsom & Robinson 2429* (MO). La Mesa, N of El Valle, *Gentry 6840* (MO). El Valle, *Gentry & Dwyer 3631* (MO). N of El Valle, 2500–3000 ft, *Lewis et al. 1743* (GH, MO, US). 8 mi N of El Valle, *Luteyn & Kennedy 1722* (MO). Cerro Pilón, 2000 ft, *Porter et al. 4359* (MO, SCZ, UC), *4579* (MO, SCZ, UC), *4587* (MO). El Valle, ca. 1000 m, *Wilbur et al. 11134* (MO). COLÓN: Río Miguel de la Borda near Guasimo, *Croat 9917* (MO). Santa Rita Ridge, *Croat 13836* (MO). María Chiquita, *Dwyer & Kirkbride 7801* (MO, UC). Santa Rita

Lumber Road, 5.4 km E of Transisthmian Highway, *Folsom 3674* (MO). Río Piedras and Puerto Pilón, *Lewis et al. 3230* (MO, UC). Santa Rita Ridge, E of Transisthmian Highway, *Lewis et al. 5271* (MO, SCZ, UC), *5284* (MO, SCZ, UC, VEN). 7 km NE of Puerto Pilón, road to Portobelo, *Nee 6677* (MO). Achiote, *Tyson et al. 4552* (MO). 8 km NE of Santa Rita, *Wilbur & Weaver 10863* (MO). Santa Rita Ridge, *Wilbur & Luteyn 11848* (MO). DARIÉN: Río Tuquesa, gold mining camp of Tyler Kittredge, *Croat 27138* (MO). PANAMÁ: Cerro Jefe, ca. 2700 ft, *Blum & Duke 2191* (MO). Cerro Azul, ca. 2000 ft, *Carrera 5* (MO). Goofy Lake to Cerro Jefe, *Correa & Dressler 269* (MO). 3.5 mi W of Goofy Lake, Cerro Azul, *Croat 11564* (MO). Cerro Campana, *Croat 14760* (MO). Goofy Lake to Cerro Jefe, *Croat 15233* (MO). 6 mi above Goofy Lake, *Croat & Porter 15233* (MO). Cerro Azul, *Croat 17305* (MO). El Llano-Carti Road, 7–12 km from Interamerican Highway, 1100–1200 ft, *Croat 25142, 33747* (both MO). Cerro Jefe, *D'Arcy & D'Arcy 6244* (MO); *Duke 8019* (MO); *Duke 8384* (MO). Cerro Campana, 2700–3000 ft, *Duke 8656* (MO). Cerro Jefe, *Duke 9384, 9435, 9437* (all MO). Goofy Lake toward Cerro Jefe, *Dwyer 7074* (MO). Cerro Jefe, *Dwyer & Hayden 8091* (GH, MO, US). Cerro Azul and Cerro Jefe, *Elias & Hayden 1791* (GH, MO). Cerro Jefe, *Elias & Hayden 1795* (MO, UC). El Llano to Cartí Road, 8 km N of Panamerican Highway, 350–500 m, *Folsom 1429* (MO). Cerro Campana, *Gentry 1830* (MO); *Hayden 121* (MO); *Kirkbride & Crebbs 32* (MO); *Kirkbride & Dwyer 7844* (GH, MO, US); *Lewis et al. 1915* (GH, MO, US). Altos del Río Pacora, 2500 ft, *Lewis et al. 2339* (COL, MO, UC, VEN). Cerro Campana, *Lewis et al. 3035* (COL, MO, UC, VEN). Cerro Jefe, *Liesner 588* (MO). Cerro Jefe and La Eneida, *Luteyn & Foster 1131* (MO). Cerro Campana, *McDaniel 6860* (MO). El Llano-Cartí Road, 18 km from Highway, *Mori et al. 4576* (MO); *Mori & Kallunki 5603* (MO). 1 mi N of Goofy Lake, *Oliver et al. 2674* (MO). Cerro Campana, *Porter et al. 4178* (COL, DUKE, MO), *4895* (MICH, MO), *4967* (MO, SCZ). Cerro Jefe, *Porter et al. 5061* (COL, DUKE, MO, SCZ, UC, VEN). Cerro Azul, *Tyson 2150* (MO). Cerro Jefe, *Tyson et al. 3333* (MO, SCZ). E slope of Cerro Jefe, *Tyson 3437A, 3535* (both MO). 4 mi E of Cerro Jefe, *Tyson 3576* (MO). Cerro Jefe, *Tyson et al. 3576* (SCZ), *4404* (MO). Cerro Jefe beyond Cerro Azul, 2700–3000 ft, *Wilbur & Teeri 13608* (MO). SAN BLAS: Airport Mandinga, *Duke 8915* (MO). VERAGUAS: Río Primero Braso, 2.5 km beyond Agriculture School Alto Piedra near Santa Fé, 700–750 m, *Croat 25469* (MO). Between Escuela Agricola and Alto Piedra above Santa Fé, 730–770 m, *Croat 25927* (MO). 12 km NW of Santa Fé, *D'Arcy 10334* (MO). 2 km N of Escuela Agricola Alto de Piedra, *Mori & Kallunki 2567* (MO). NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori et al. 4017* (MO). 3–4 km by road W of Santa Fé, ca. 2500 ft, *Nee 11298* (MO). COLOMBIA: CHOCO: Top of Serrania del Darién, Frontier with Panama, Cerro Mali, 1400 m, *Gentry et al. 16972* (MO).

2. **Sabicea villosa** R. & S., Syst. Veg. 5: 265. 1819. TYPE: Venezuela, *Bonpland*, not seen.

S. hirsuta H.B.K., Nov. Gen. Sp. Pl. 3: 417. 1820. TYPE: not seen.

2a. **Sabicea villosa** R. & S. var. **villosa**.

Woody *vines*, the branchlets terete, villose, the hairs spreading. *Leaves* elliptic to elliptic rhomboid, rarely oblong rotund or obovate, 4–14 cm long, 1.8–6.0 cm wide, deltoid, widely deltoid to subobtuse at the apex, cuneate to obtuse at the base, the costa prominulous above and beneath, the lateral veins 8–12, arcuate, stiffly chartaceous, concolorous or discolorous, the hairs elongate above, often restricted to the costa and the veins, densely hairy beneath, the hairs spreading; petioles slender, to 1.5 cm long; stipules ovate oblong, to 1.3 cm long, the hairs spreading outside, glabrous within. *Inflorescences* axillary, usually found in all the axils of the ultimate twiglets, epedunculate, the flowers congested, the heads to 1.2 cm in diam. *Flowers* sessile; hypanthium densely pilose or hirsute, the calycine cup ca. 1 mm long, the lobes 5, narrowly ovate oblong, to 4 mm long, glabrous or with a few elongate hairs within, pilose or hirsute outside; corolla white, the tube narrowly infundibuliform, to 5 mm long, ca. 0.6 mm wide, densely or sparsely pilose outside, the lobes 5, triangular, 1.0–1.8 cm long, acute. *Fruits* sessile, rotund or oblong, to 0.8 cm long, pink, purple, lavender, densely to sparsely golden pilose, the calycine lobes persistent, often reflexed.

Sabicea villosa is widely distributed in Middle America and northern South America.

BOCAS DEL TORO: Almirante, *Blum 1368* (MO); *Cooper 75* (MO). Punta Pena near Chiriquicito, 1000 ft, *Lewis et al. 2161* (GH, MO, US). 4–6 mi N of Almirante, *McDaniel 5107* (MO). Water Valley, *Wedel 1497, 1590, 1782* (all MO). Chiriquí Lagoon, *Wedel 2681* (MO). COCLÉ: Boca del Toabre, confluence of Río Toabre and Río Cocle del Norte, *Lewis et al. 5497* (MO, SCZ, UC, VEN). COLÓN: Guasimo, *Croat 9974* (MO).

2b. **Sabicea villosa** var. **adpressa** (Wernham) Standley, Publ. Field Columbian Mus., Bot. Ser. 7: 52. 1930.

Woody *vines*, the branchlets with appressed hairs. *Leaves* elliptic to elliptic rhomboid, 3–13 cm long, 2–6 cm wide, the hairs appressed above and beneath; stipules with the hairs appressed. *Inflorescences*, *flowers* and *fruits* as in *S. villosa* var. *villosa*. "Ibia ina" (*Stier 232*).

Sabicea villosa var. *adpressa* is known only from Panama, Colombia, and Peru.

BOCAS DEL TORO: Between Almirante and Ojo de Agua, *Croat 38204* (MO). Milla 5, railroad tracks, *Croat & Porter 16494* (MO). Little Bocas, Chiriquí Lagoon, *Wedel 2558* (MO). CANAL ZONE: Río Pedro Miguel, Madden Forest, *D'Arcy & D'Arcy 6095* (MO). Ft. Kobbe, *Duke 3939* (MO). Coco Solo, *Duke 4285* (MO). Military Road K-9, *Ebinger 521* (MO). Chagres, *Fendler 180* (MO). Pipeline Road, 14.4 km from Chagres Airport Road, *Mori & Kallunki 2055* (MO). Cerro Pelado, 1 km N of Gamboa, 200–220 m, *Nee 7426* (MO). BARRO COLORADO ISLAND: *Aviles 226* (MO); *Croat 6703, 9431, 11725* (all MO); *Ebinger 281* (MO); *Montgomery 14* (MO); *Shattuck 704, 1130* (both MO); *Woodworth & Vestal 524* (MO). DARIÉN: Río Uruti, *Bristan 231 a* (MO). Río Pirre, *Duke 4963* (MO). Periaque Hill, Río Sabana and Lara, *Tyson et al. 4732* (MO). PANAMÁ: 6 mi E of Chepo on Panamerican Highway, *Duke 4076* (MO). El Llano and Río Mamoni, *Duke 5599* (MO). San Jose Island, *Johnston 1135* (MO). Chiman, *Lewis et al. 3290* (MO). Cerro Campana, *Luteyn & Kennedy 1798* (MO). Arraijan, *Woodson et al. 1353* (MO). SAN BLAS: Hills SE of Puerto Obaldia, *Croat 16708* (MO). Isla de Ailigandí, *Dwyer 6840* (MO). Mainland, opposite Ailigandí, *Lewis et al. 160* (MO, SCZ, VEN). Molia, *Stier 42* (MO). Tappakanti, *Stier 232* (MO).

3. **Sabicea stellaris** Dwyer.[136] TYPE: Panama, *Dressler 4887* (MO, holotype).

Vine, branched, the branchlets terete, drying red, villose to hirsute, the nodes well spaced. *Leaves* elliptic, 5–13 cm long, 2.0–5.5 cm wide, apically deltoid, acuminate, the acumen vague or distinct, to 1 cm long, usually minutely apiculate, cuneate or acute at the base, the costa slender, prominulous, drying pink below, the lateral veins ca. 15, arcuate, somewhat whitish proximally beneath, papyraceous, concolorous, with scattered thin weak white appressed 1–2 mm hairs above and beneath, these more dense beneath especially along the costa; petioles slender, ca. 1 cm long; stipules ovate rotund, to 8 mm long, to 5.5 mm wide, acute, membranous, venose, pilose outside and at base within, with 6–10 subulate, red glands at base within, these 0.1–0.2(–1.5) mm long. *Inflorescences* axillary, sessile, to 1 cm long, the flowers densely congested; bracts several per inflorescence, similar to stipules in texture and pubescence. *Flowers* sessile; hy-

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[136] *Sabicea stellaris* Dwyer, spec. nov. *Vitex* ramulis villosis ad hirsutis. *Folia* elliptica 5–13 cm longa, 2.0–5.5 cm lata, venis lateralibus ca. 15; petiolis ad 1 cm longis; stipulis ovato-rotundis, ad 8 mm longis, ad 5.5 cm latis, extus pilosis. *Inflorescentiae* axillares ad 1 cm longae. *Flores* lobis calycis oblongis foliosis, 3–6 mm longis, inaequalibus extus villosis; corolla tubo ca. 4 mm longo. *Fructus* sessiles rotundi, ca. 3.5 mm in diam. costati villosi.

panthium short with densely appressed, elongate silky hairs outside; calycine cup short, appearing ringlike at the apex within (top view) because of the ovarian disc, the calycine lobes spreading in starlike fashion, oblong, foliose, 3–6 mm long, unequal, acute, villose outside, with a minute linear oblong gland between the lobes; corolla white, the tube ca. 4 mm long, carnose, drying red, villose in upper ⅔ outside, the lobes triangular, ca. 1 mm long, ovarian disc doughnut shaped, 0.3 mm long. *Fruits* sessile, rotund, ca. 3.5 mm in diam., ribbed, the ribs crassate, obtuse, villose above the middle, the raphides abundant.

Sabicea stellaris is known only from Panama. The collector notes that the fruits are pink. On dissecting a mass of flowers a number of small insects were seen; it is unusual to find insects in inflorescences of the Rubiaceae, at least in Panama. This probably has some relation to the small glands found at the base of the stipules as well as the junction of the calycine teeth. The new species is characterized by its large stipules and calycine teeth.

PANAMÁ: Río Pequeni, 10–15 minutes upstream from hydrographic station by motor, *Dressler 4887* (MO).

77. SCHRADERA

Schradera Vahl., Eclog. Amer. 1: 35. 1796. Nomen conserv. TYPE: *S. capitata* Vahl, nom. illeg. = *S. involucrata* (Swartz) K. Schumann.

Fuchsia Swartz, Prodr. Veg. Ind. Occ. 62. 1788, not *Fuchsia* L. 1753.
Urceolaria Willd. in Cothen. Disp. Veg. Meth. 10, 1790. Nomen rejic. TYPE: *U. exotica*.
Uncariopsis Karst., Linnaea 30: 152. 1859. TYPE: *U. suaveolens* Karst.

Epiphytic *shrubs*. *Leaves* usually leathery. *Inflorescences* terminal, pedunculate, the flowers capitate, surrounded by a broad involucre. *Flowers* with the calyx turbinate, the calycine cup cupuliform, truncate; corolla salverform, the tube broad, villous within, the lobes 5–10, narrow, spreading or reflexed, valvate; stamens 5–10, the anthers subsessile, dorsifixed, included or exserted, the filaments adnate to the corolla tube; ovary 2–4-celled. *Fruits* a syncarp, fleshy, baccate; seeds numerous, small, compressed, suborbicular, horizontally attached.

Schradera occurs in Panama, tropical South America, and in the West Indies. It is a genus of about 16 species.

Literature:

Steyermark, J. 1963. *Schradera*. Mem. New York Bot. Gard. 10: 259–278.

1. **Schradera blumii** Dwyer & Hayden, Phytologia 15: 59. 1967. TYPE: Panama, *Tyson et al. 3218* (MO, holotype).–FIG. 90.

Scandent *shrubs*, the branches quadrangular, smooth, glabrous, rimose, the pith hollow in thicker twigs. *Leaves* narrowly oblong, often falcately oblong, 7–15 cm long, 3–5.5 cm wide, acute at the apex, scarcely acuminate, basally acute to rounded, often slightly inequilateral, the costa prominulous above and beneath, the lateral veins 10–12, arcuate, evanescent above, prominulous beneath, the

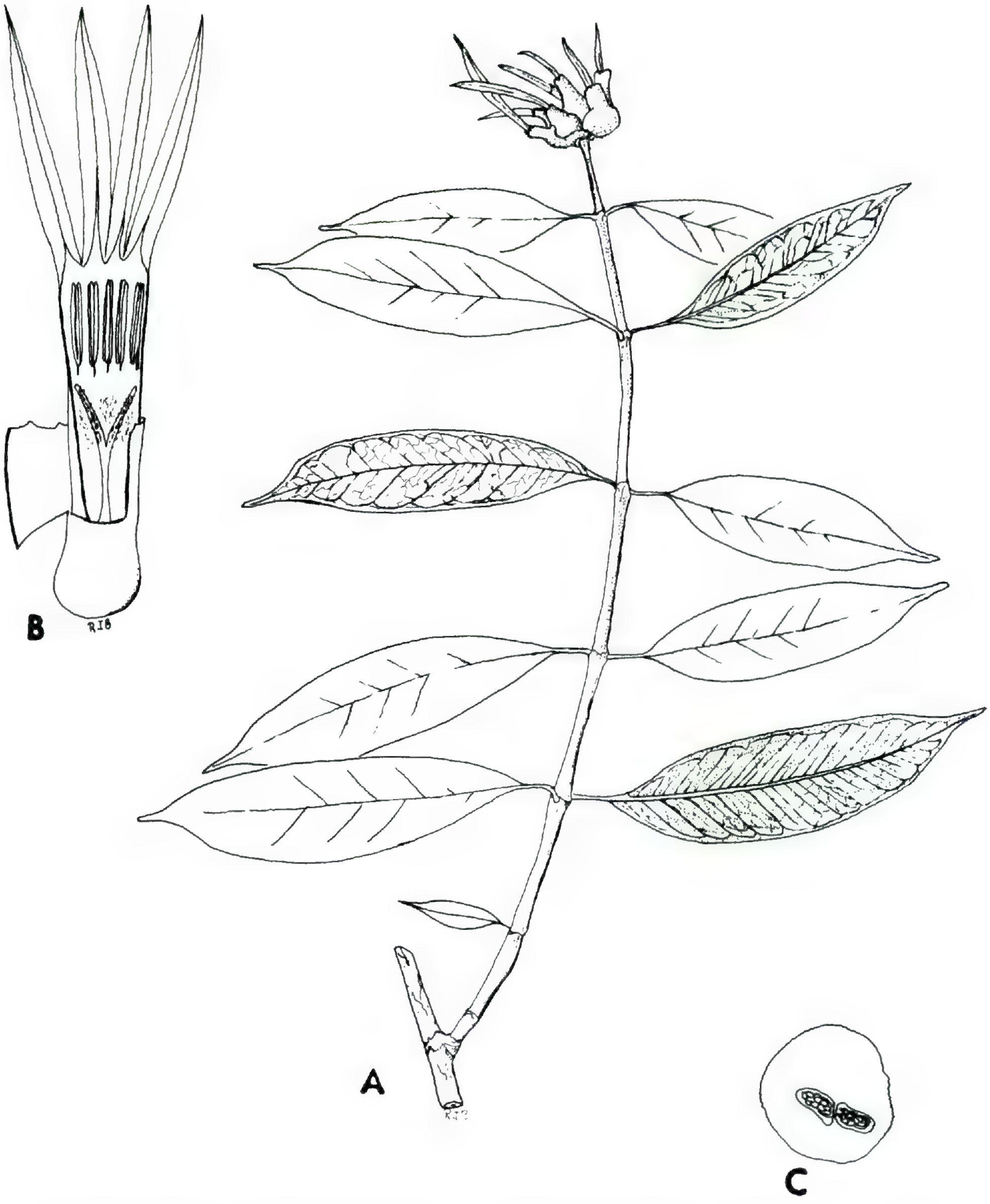

FIGURE 90. *Schradera blumii* Dwyer & Hayden.—A. Habit (×½).—B. Flower opened to show interior (×1½).—C. Ovary cross section (×2). [After *Correa et al. 1865*.]

intervenal areas spreading, reticulate, glabrous, fleshy, drying black, coriaceous; petioles 1.5–2.5 cm long, rigid; stipules caducous, presumably connate for ⅔ of the length, the stipular scars conspicuous, ca. 1 mm long. *Inflorescences* terminal, black when dry, to 4.5 cm long, either pedunculate for 2 cm or peduncles absent and then the tip of the twig with 3 ternately disposed branches, to 2 cm long, ca. 0.3 cm wide, the flowers aggregated into globose heads or cymules; bracts black when dry, the outermost united into a cupule ca. 2.5 cm wide, the margin un-

dulate. *Flowers* with the hypanthium oblong rotund, to 10 mm long, glabrous, the calycine cup urceolate, to 8 mm long, truncate, the teeth absent, coriaceous, crassate, glabrous; corolla white, the tube slender, cylindrical, falcate in bud, to 30 mm long or longer, about the same length as the corolla lobes, stiffly carnose, glabrous outside, villose within below the middle, the lobes 4, narrowly subulate, triangular in cross section, subcoriaceous, glabrous; stamens 5, the anthers narrowly oblong, ca. 5.5 mm long, obtuse, the filaments ca. 1 mm long, plane, ca. 0.25 mm wide; style slender, the stigmas 2, free for ca. 1 mm, connate for ca. 2 mm. *Fruits* disposed as a rotund mass, to 3.5 cm in diam., the persistent calycine cup cylindrical or pipelike, to 1 cm long, to 0.4 cm wide, truncate, glabrous, as long as the rotund body, shiny white, black when dry.

Schradera blumii is known from Panama and Colombia. *Kirkbride & Duke 1300* notes that "Choco use (it) to stain tongue black."

COCLÉ: La Mesa above El Valle, *Croat 13404, 14390, 25379* (all MO); *Sullivan 469* (MO). Cerro Pilon, *Duke 12190* (MO); *Dwyer 8608* (MO). Alto Calvario, summit, 900 m, *Folsom 2488* (MO). Cerro Pilon, *Kirkbride 1091* (MO); *Luteyn & Kennedy 1624* (MO); *Mori 6625* (MO); *Porter et al. 4613 A* (MO); *Wilbur et al. 11157* (MO). DARIÉN: Cerro Pirre, 1000–4000 m, *Gentry & Clewell 6892* (MO). Cuasi-Caná Trail between Cerro Campamiento and La Escalera, E of Tres Bocas, *Kirkbride & Duke 1300* (MO). PANAMÁ: El Llano-Carti Road, *Correa et al. 1865* (MO); *Mori & Kallunki 2898* (MO); *Mori et al. 4594* (MO). Cerro Jefe, trail NE of summit, ca. 1000 m, *Mori & Kallunki 6090* (MO). Cerro Jefe in Clusia forest, 2700–3000 ft, *Tyson et al. 3218* (MO). VERAGUAS: Beyond Río Tres Brazos, 9 km from Santa Fé, *Croat 25593* (MO). Cerro Tute, ca. 10 km NW of Santa Fé, above 1000 m, *Mori et al. 7600* (MO). COLOMBIA: CHOCO: 11 km E of Tutunendo on Quibdo-Medellin Road, 100–200 m, *Gentry & Fallen 17545* (MO).

78. SIMIRA

Simira Aubl., Hist. Pl. Guiane 1: 170. 1775. Not *Simira* Raf. 1836 TYPE: *S. tinctoria* Aublet.

Sickingia Wills., Ges. Naturf. Freunde Berlin Neue Schriften 3: 445. 1800. TYPE: *S. erythroxylon* Willd.

Arariba Mart., Sitzb. Akad. Münch. 323. 1860. LECTOTYPE: *A. rubra* Mart.

Trees or shrubs, the wood turning red to purple on cutting. *Leaves* large; stipules persistent or caducous, usually large and glandular basally. *Inflorescences* terminal or axillary, paniculate, the flowers in cymes or capitate. *Flowers* pedicellate or sessile, bibracteolate; calycine cup cupuliform or bell shaped, truncate, edentate or with 4–6 teeth; corolla variable in color, fragrant, tubular to campanulate, the lobes 4–5, imbricate; stamens 4–6, exserted, the anthers dorsifixed, sagittate at the base, the filaments connate basally, attached near the middle or at the base of the tube, villous; ovary 2-celled, the ovules numerous, horizontally biseriate. *Fruits* capsular, usually globose, loculicidally dehiscent; seeds numerous, large, winged horizontally.

Simira ranges from Mexico through Central America and South America. It is a genus of about 35 species.

Literature:

Bremekamp, C. E. B. 1954. The identity of *Simira tinctoria* Aubl., Acta Bot. Neerl. 3: 150–153.

Steyermark, J. 1972. *Simira*. The Botany of the Guyana Highland. Mem. New York Bot. Gard. 23: 299–309.

a. Leaves ovate or oblong rotund; fruits 3–6 cm in diam.
  b. Trees to 5 m tall; corolla 3.5–5.5 mm long (fide Steyermark); fruits ca. 3 cm in diam. ---------- 2. *S. klugei*
  bb. Trees to 20 m tall; corolla to 8 mm long; fruits ca. 6 cm in diam. ---------- 3. *S. maxonii*
aa. Leaves oblong; fruits ca. 1.3 cm in diam. ---------- 1. *S. darienensis*

1. **Simira darienensis** Dwyer.[137] TYPE: Panama, *Bristan 1187* (MO, holotype).

Small *trees* or *shrubs*, the wood hard, the tips of the branchlets angular, glabrous, the bark smooth, cracking. *Leaves* oblong, 13–38 cm long, 6.5–20.0 cm wide, often widest above the middle, deltoid or obtuse at the apex, short acuminate, the acumen to 3 cm long or longer, widely cuneate basally, ultimately truncate, ? vaguely auriculate, the costa slender except to 0.3 cm wide proximally, prominulous above, prominent only proximally beneath, the lateral veins 15–20, well spaced, prominulous beneath, arcuate, stiffly chartaceous, smooth and glabrous above, sparsely appressed villosulose on costa and veins beneath, the intervenal areas open reticulate; petioles crassate, to 1 cm long, expanded at the base, 0.2–0.4 cm wide basally; stipules not seen. *Inflorescences* terminal, cymose paniculate, to 11 cm long, the peduncles 1–3, 5.0–8.5 cm long, angular, rigid, golden puberulent, the median peduncle about 2 times longer than the lateral peduncle, the lateral branches few, well spaced, usually opposite, to 2.5 cm long, angular ascending, the flowers few, terminal, the smaller bracts subulate, 3–5 mm long, the larger bracts confined to the median peduncle, ovate, to 8 mm long, suberect, coriaceous, concave, puberulent outside. *Flowers* with the hypanthium narrowly cylindrical, expanded at the apex, drying black, the calyx cup chalice shaped, ca. 4 mm long, puberulent, the lobes 5, irregular, obtuse, to 2.2 mm long, stiffly petaloid, puberulent; corolla with the tube cup shaped, ca. 4.5 mm long, glabrous except golden puberulent at the mouth, the lobes oblong, to 3.5 mm long, somewhat expanded, scarcely cucullate at the apex, the lower ⅔ giving the impression of a wide claw, to 1 mm wide, puberulent marginally; stamens 4(?), the anthers sagittate, ca. 3 mm long, densely golden villosulose above the middle, attached ca. 1 mm from the base of the tube; ovarian disc cushion shaped, 4-lobed, drying black; stigmas 2, narrowly oblong, to 2.3 mm long, reflexed; ovary 2-celled, the septum thin, the ovules numerous. *Fruits* (juvenile) sessile, oblong, to 1.8 cm long, ca. 1.3 cm wide, terete in cross section, truncate to rounded at the apex, minutely granulose, the persistent ovarian disc lignose, compressed, buttonlike, surrounded by a delicate ring of persistent calyx lobe bases.

Simira darienensis is known only from Panama. One of the important diagnostic features of the genus, i.e. the wood being pink after exposure to air, is not

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[137] *Simira darienensis* Dwyer, spec. nov. *Arbores* ramulis ultime angulatis glabris. *Folia* oblonga, 13–38 cm longa, 6.5–20.0 cm lata, venis lateralibus 15–20, rigido-chartacea in costa venisque subtus sparse appresso-villosulosa; petiolis ad 1 cm longis. *Inflorescentiae* terminales cymoso-paniculatae, ad 11 cm longae, pedunculis 1–3, 5.0–8.5 cm longis, ramis paucis plerumque oppositis, ad 2.5 cm longis, floribus paucis terminalibus, bracteis maioribus ovatis, ad 8 mm longis, coriaceis extus puberulis. *Flores* cupula calycis ca. 4 mm longa, lobis irregularibus obtusis, ad 2.2 mm longis; corolla tubo ca. 4.5 mm longo, glabro praeter faucem, lobis ad 3.5 mm longis; antheris sagittatis, ca. 3 mm longis. *Fructus* sessiles oblongi in ambitu teretes extus minuto-granulosi.

evident in the two collections cited below. The pink color may fade in herbarium material. The fruits of the new species are oblong and much reduced in contrast to those of *S. klugei* (Standley) Steyermark and *S. maxonii* (Standley) Steyermark. *Simira klugei* has much smaller leaves than the new species. The leaf shape and the width of the petals serve to distinguish *S. darienensis* from *S. maxonii*.

DARIÉN: Río Ucurganti, *Bristan 1187* (MO). Río Chucunaque between Río Membrillo and Río Subcuti, *Duke 8606* (MO).

2. **Simira klugei** (Standley) Steyermark, Mem. New York Bot. Gard. 23: 302. 1972.

Calderonia klugei Standley, J. Wash. Acad. Sci. 15: 6. 1924. TYPE: Panama, *Kluge 19* (US).
Sickingia klugei (Standley) Standley, Trop. Woods 22: 10. 1930.
S. parvifolia Pittier, Bol. Mus. Com. Ind. Venez. 1: 71. 1926. TYPE: Venezuela, *Saer 24*, not seen.

Trees to 5 m tall, the branchlets terete, ultimately angular, drying ashen grey, often rimose, short and angular ascending, to 9 cm long, glabrous, branching dichotomously. *Leaves* ovate, 4.0–7.5 cm long, 2.0–4.5 cm wide, deltoid or obtuse at the apex, at the base cordate, obtuse or rounded, usually auriculate, the costa prominulous or plane above, prominent beneath, the lateral veins 7–8, widely arcuate, the intervenal areas reticulate, papyraceous, shiny and glabrous above, moderately white villous beneath or with a few elongate hairs on the costa and the veins; petioles slender, 3–6 mm long, pubescent; stipules ovate triangular, 7 mm long, drying brown, puberulent outside. *Inflorescences* terminal, the flowers aggregated into a hemispherical head to 1.5 cm wide. *Flowers* (buds only seen) subsessile; hypanthium short, the teeth evanescent; corolla 4 mm long, rounded at the apex. *Fruits* sessile, subrotund, glabrate, 3 cm in diam.; seeds semiorbicular.

In Venezuela a similar species, *S. rubescens* (Benth.) Bremekamp, occurs. In his key to *Simira*, Steyermark (1972) distinguished *S. rubescens* from *S. klugei* in its: "flowers usually 4-merous; corolla 3.5–5.5 mm long; calyx 1.0–1.5 mm long, the lobes 0.5–1.0 mm long; fruit 1.5 cm long by 1.8–2.0 cm broad; leaf blades as broad as long or to 1.7 times longer than broad, usually noticeably broadest around the middle, usually 2.5–8.0 cm long; lateral nerves 5–8 on each side."

The common name of the species in Panama is "Palo Colorado."

PANAMÁ: Chepo, *Kluge 19* (F, photo US). Alhajuela, *Pittier 3499* (F, US).

3. **Simira maxonii** (Standley) Steyermark, Mem. New York Bot. Gard. 23: 306. 1972.—FIG. 91.

Genipa maxonii Standley, J. Wash. Acad. Sci. 8: 642. 1918. TYPE: Panama, *Maxon 4848* (US, holotype).
Sickingia maxonii (Standley) Standley, Trop. Woods 14: 30. 1928.

Trees to 20 m tall forming a spreading crown, the twiglets ultimately 4-angled, usually turning red on exposure to air, glabrous, the nodes with subrotund scars, drying red. *Leaves* oblong rotund, 12.5–32.0(–60.0) cm long, 10–26(–40) cm wide, widely cuneate at the apex, acuminate, the acumen 2.0–3.5 cm long (probably longer in larger leaves), tapering obtusely toward the base and often slightly

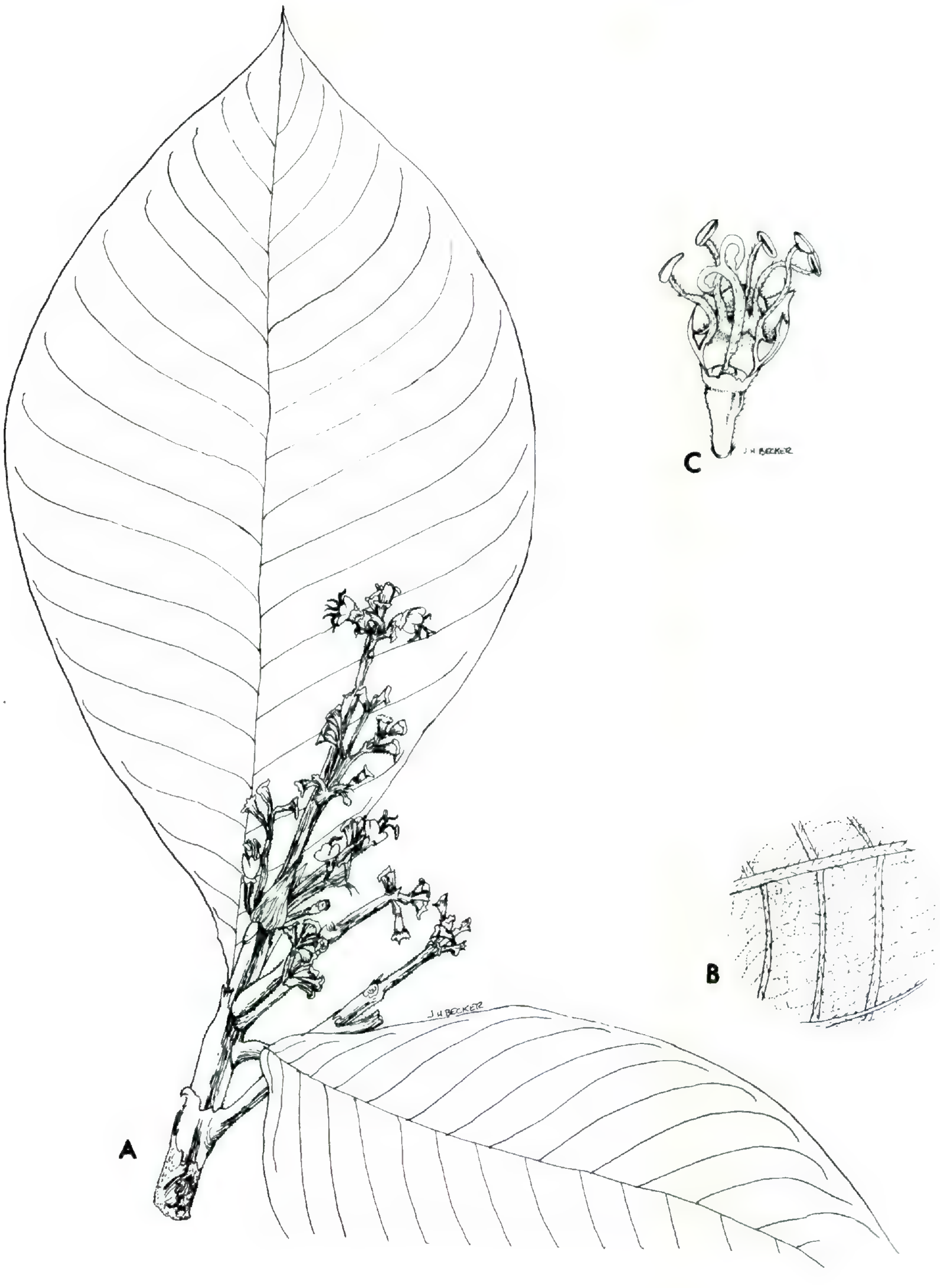

FIGURE 91. *Simira maxonii* (Standley) Steyermark.—A. Habit (×½).—B. Leaf venation (×2½).—C. Flower opened to show interior (×2). [After *Howell 51*.]

auriculate, the costa immersed above, prominent beneath, often conspicuously lenticellate, the lateral veins 16–20, at first strict, finally arcuate near margin, the secondary veins irregularly pinnatiform, thinly coriaceous or stiffly papyraceous, deep red brown above, often reddish beneath, glabrous above, glabrescent to

densely white villose beneath; petioles absent or to 0.5 cm long; stipules not seen. *Inflorescences* terminal, solitary, paniculate, to 10 cm long; peduncle, if present, 1–3 cm long, the branches few, radiate from the tip of the twiglet or disposed in 2 pairs along the rachis, the branches opposite, to 2.5 cm long, drying red, the hairs stiff and short, a large bract located at the base. *Flowers* with pedicels 3 mm long; hypanthium to 8 mm long, pubescent, the calycine lobes 5, longer than the cup, compressed oblong, wider than long, the margin ciliolate, the cup with a number of glands within, these oblong, 0.1–0.2 mm long, brown; corolla yellow green turning orange, funnelform, to 8 mm long, minutely puberulent outside, villosulose at point of filament attachment, coriaceous to thickly carnose, the lobes oblong rotund or ovate oblong, to 2.5 mm long, obtuse; stamens 4, the anthers slightly or conspicuously exserted, oblong, 2.3–3.0 mm long, obtuse, the filaments 3–5 mm long, pubescent, carnose, each dilated at the point of attachment; ovarian disc doughnut shaped, ca. 1 mm long, the style to 10 mm long, somewhat thickened, pubescent, the stigmatic lobes oblong rotund or ovate rotund, to 2.5 mm long, obtuse. *Fruits* subsessile, rotund or oblong, ca. 6 cm in diam., the walls thick and lignose, not ribbed; seeds to 2.5 cm long, broadly winged.

Simira maxonii is known from Costa Rica and Panama. Foster notes on his collection *2345* that the flowers are visited by hummingbirds.

What appears to be a stipule was found on *Witherspoon & Witherspoon 8651*; it is narrowly deltoid oblong, to 2 cm long, ca. 0.5 cm wide at the base, acute and glabrous. "Guaiatil," "Guaiatil Colorado," "Jagua de Montana," and "Jagua Colorado."

BOCAS DEL TORO: Without specific locality, *Wedel 443* (MO). Almirante, *Cooper & Slater 3* (US). CANAL ZONE: Forest along Río Gatún, *Maxon 4848* (F, photo US). CHIRIQUÍ: Progreso, *Cooper & Slater 284* (US). COLÓN: Río Guanche, *Foster et al. 2345* (F, US). Tres Brazos sawmill, Icacal, between Salud and Boca de Indio, *Howell 51* (MO). Río Guanche, ca. 3–4 km above bridge, road to Portobelo, *Witherspoon & Witherspoon 8651* (MO). SAN BLAS: Puerto Obaldía, *Gentry 1507* (MO).

79. SOMMERA

Sommera Schlecht., Linnaea 9: 602. 1834. TYPE: *S. arborescens* Schlecht.

Shrubs or *trees*, the branchlets pubescent, entire, mostly elliptic, membranous to chartaceous, the intervenal areas conspicuously lineolate; petioles present; stipules interpetiolar, deciduous. *Inflorescences* axillary, pedunculate, the flowers disposed in cymes, corymbs or racemes; bracts and bracteoles present. *Flowers* with the hypanthium turbinate, the calycine cup 4–5-lobed, the lobes broad, often foliose; corolla funnelform or campanulate, hairy outside and within; anthers dorsifixed, the filaments short, pubescent; ovarian disc cup shaped, the style slender, short, the stigmas linear, often hairy, the ovary 2-celled, the ovules numerous. *Fruits* baccate, usually globose; calyx cup and lobes persistent; seeds many, obtusely angular.

Sommera, a genus of about a dozen species, occurs throughout Central America and tropical South America. It is readily recognized by the lineolate character of the intervenal areas, coupled with the broad calycine lobes. The

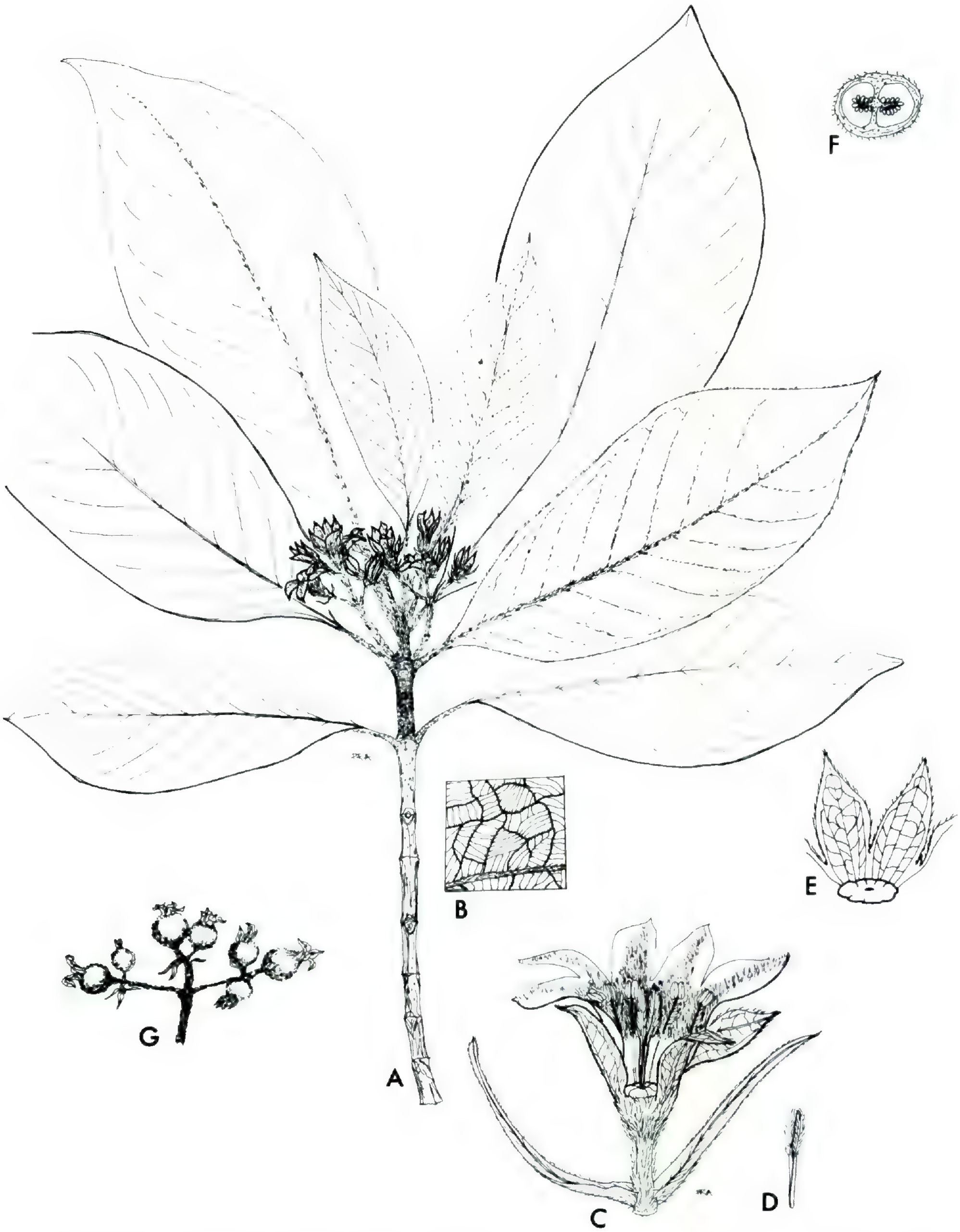

FIGURE 92. *Sommera donnell-smithii* Standley.—A. Habit (×.45).—B. Leaf venation (×2⁴/₅). [After *Croat 15760.*]—C. Flower, part of perianth removed to show interior (×2⁴/₅).—D. Stigma (×2⁴/₅).—E. Calyx (×2⁴/₅).—F. Ovary cross section (×5²/₅). [After *Allen 1733.*]—G. Fruit (×.45). [After *Ebinger 969.*]

genus commemorates C. N. Sommer, an entomologist and a friend of D. F. L. Schlechtendal who authored the genus.

1. **Sommera donnell-smithii** Standley, Contr. U.S. Natl. Herb. 17: 436. 1914. TYPE: Costa Rica, *Donnell Smith 6592* (US, holotype).—FIG. 92.

S. mesochroa Standley, Contr. U.S. Natl. Herb. 17: 439. 1914. TYPE: Panama, *Maxon 4941* (US, holotype).

Trees to 40 ft tall, the branches terete, glabrous to puberulent drying black brown, often ultimately angular. *Leaves* oblong to obovate oblong, to 25.5 cm long, to 14 cm wide, cuneate at the apex, cuspidate, the cusp to 2 cm long, 0.3–0.4 cm wide in the middle, acute or cuneate, often slightly inequilateral at the base, the costa prominulous above, prominent beneath, to 0.25 cm wide proximally, the lateral veins 10–17, strict then arcuate, prominulous beneath, the intervenal areas lineolate, papyraceous, appressed strigose villose above, villose beneath, often densely so on the costa and secondary veins; petioles to 3.5 cm long, to 0.25 cm wide, pubescent; stipules connate, lanceolate, 1.5–3.5 cm long, acute, thin caducous. *Inflorescences* axillary, to 6 cm long, the peduncles to 2 cm long, strongly ascending, golden villose, the rachis often with 1–2 pairs of opposite branches, the flowers numerous in cymules, corymbs or racemes. *Flowers* on pedicels to 8 mm long; hypanthium broadly rotund, truncate, the 5 calycine teeth united into a short tube, unequal, oblong, to 7 mm long, obtuse, petaloid, venose, marginally pubescent; corolla white, the tube compressed cylindrical, to 4 mm long, ca. 2 mm wide, puberulent outside, the lobes oblong, as long as the tube, villose adaxially; stamens 5, the anthers small, oblong, to 0.8 mm long, obtuse, dorsifixed, the filaments short, attached above the middle of the tube; ovarian disc cushionlike, the style to 2.5 mm long, glabrous, the stigmas 2, subulate, erect, crassate, pubescent, ca. 1.5 mm long, the ovary thickly walled, bilocular, the septum thin, the ovules numerous on 2 intrusive placentas. *Fruits* baccate, rotund or oblong, ca. 1 cm in diam., the calycine tube and lobes persistent, cylindrical, the pericarp densely villose, turning red or red black at maturity.

Sommera donnell-smithii is known only from Costa Rica and Panama.

BOCAS DEL TORO: Río Teribe, *Kirkbride & Duke 456, 550* (both MO). CHIRIQUÍ: Boqueté, Finca Collins, *Blum & Dwyer 2543A* (MO). Monte Rey above Boquete, *Croat 15760* (MO). Boquete, *Davidson 815* (MO, US). Cerro Horqueta, *Duke A13715* (MO). Between Guardia Post and Volcan City Limits, 3000–4000 ft, *Folsom et al. 2037* (MO). Boquete, *Folsom 2200* (MO). 2.5 km from Questa Piedra, Río Monte Road at stream, *Folsom 3976* (MO). Boquete, *Maxon 4941* (US); *Pittier 3137* (US). Cerro Horqueta, Quebrada Horqueta, 1600 m, *Webster 16701* (MO). COCLÉ: El Valle, *Allen 1575* (MO), *1733* (MO, US); *Duke & Dwyer 13208* (MO). Cerro Pilon, *Duke & Dwyer 13893* (MO); *Dwyer & Correa 7921* (MO). El Valle, *Ebinger 968* (MO). Road to La Mesa, El Valle, 2200 ft, *Tyson 6898* (MO). DARIÉN: Rio Tacarcuna, old Tacarcuna Village, 850 m, *Gentry & Mori 13581* (MO). PANAMÁ: Cerro Campana, *Duke 8681* (MO).

80. SPERMACOCE

Spermacoce L., Sp. Pl. 102. 1753; Gen. Pl. ed. 5: 44. 1754. LECTOTYPE: *S. tenuior* L.

Herbs, annual or perennial, the stems angled. *Leaves* linear or narrowly lanceolate; petioles short; stipules united to the petioles, the sheath with few to

numerous slender appendages. *Inflorescences* axillary, sessile, the flowers glomerulate; bracts setaceous and filiform, subtending the inflorescences. *Flowers* small, the calycine cup scarcely measurable, the calycine lobes 4; corolla white or lavender, hypocrateriform to infundibuliform, the lobes 4, valvate; stamens 4, affixed variously in the corolla tube; stigmas connate or distinct. *Fruits* dry, the mericarps 2, unequal, each with a single seed, the smaller mericarp opening, the larger remaining closed; calyx persistent; seeds oblong.

Spermacoce, a genus of about 100 species, occurs in the tropics of the New World and the Old World. Few collections have been made in Panama.

Literature:

Rendle, A. B. 1934. Linnaean species of *Spermacoce*. J. Bot. 72: 329.
———. 1936. *Spermacoce remota* Lam. J. Bot. 74: 10.
Steyermark, J. 1972. *Borreria*. The botany of the Guayana Highland. Mem. New York Bot. Gard. 23: 813–814.

a. Leaves scabrous above; calyx lobes ciliate; fruits pubescent ---------- 1. *S. confusa*
aa. Leaves glabrous above; calyx lobes glabrous on the margins; fruits glabrous ---- 2. *S. tenuior*

1. **Spermacoce confusa** Rendle, J. Bot. 74. 12. 1936. LECTOTYPE: Mexico, *Galeotii 6211* (K, not seen). New name for *S. tenuior* sensu auct., non L.

S. tenuior sensu authors, not L.

Subshrubs or herbs, to ½ m tall, branching, the stems angular, scarcely thickened on the angles, scabridulous, the nodes well spaced, the uppermost leaves often narrower or shorter. *Leaves* sessile or subsessile, elliptic to narrowly oblong, 0.7–3.5 cm long, 0.1–1.0 cm wide, acute at the apex, basally acute or attenuate acute, the lateral veins 4, strongly ascending, stiffly papyraceous, concolorous, drying dull green, scabridulous above, scabrid beneath on the costa and the veins; stipules with the sheath short, scabridulous, the setas few, 5–8, longer than the sheath. *Inflorescences* axillary, those in lower axils to 0.7 cm wide, to 0.3 cm wide in the uppermost axils. *Flowers* not seen. *Fruits* oblong, ca. 2 mm long, scabridulous outside, the calycine teeth often persistent, acute.

Spermacoce confusa is a common weed in the American tropics, and it extends northward into Florida.

Steyermark (1974) has a good description of the flower: "Flowers 7–13, each one of these 0.3–1.0 cm long, calyx tube narrowly turbinate, 1.5 mm long; lobes triangularly lanceolate to linear lanceolate, acuminate, 0.4–1 mm long, conspicuously setulose ciliolate on the margins, or glabrous . . . ; corolla white, red or lilac, hypocrateriform, 1.9–2.5 mm long, the tube 1.5 mm long, 0.7 mm wide at the base, 1 mm wide above, the lobes ovate oblong, obtuse or subobtuse, 0.5–0.7 mm long, 0.4–0.5 mm wide, shorter than the tube, sparsely puberulent externally in the apical region, sparsely papillate within; anthers subglobose or oblong, 0.3 mm long; filaments 0.2 mm long."

CANAL ZONE: Thatcher Ferry Road, *Duke 5765* (MO). Chagres, *Fendler 147* (MO).

In describing *Spermacoce confusa* Rendle (1936) referred to two elements as typifying his concept, *S. tenuior* sensu Gaertner (see Rendle, 1934), and the lectotype designated above. Because Rendle apparently had this specimen in hand when he provided the new name, it is chosen as lectotype.

2. **Spermacoce tenuior** L., Sp. Pl. 102. 1753. TYPE: Not seen, see Rendle, 1934.—FIG. 93.

S. riparia Cham. & Schlecht., Linnaea 3: 355. 1828. TYPE: Brazil, *Sellow*, not seen.
S. glabra sensu authors, not Michx.

Subshrubs to ½ m tall, the stems smooth, usually glabrous, the nodes well spaced. *Leaves* elliptic, narrowly oblong or obovate oblong, 3.0–5.5 cm long, 1.0–1.5(–1.9) cm wide, acute or obtuse at the apex, basally attenuate acute or acute, the costa prominulous beneath, the lateral veins (3–)4, strongly ascending, evanescent, rigidly papyraceous, glabrous, smooth, black when dry; petioles slender, 2–10 mm long; stipules with the sheath reduced, glabrous, the setas 4–5, exceeding the sheath in length. *Inflorescences* (in fruit) axillary, to 1 cm long. *Flowers* not seen. *Fruits* subsessile, oblong to turbinate, to 3 mm long, truncate, glabrous, smooth, black, the teeth tending to persist, to 0.3 mm long, acute.

Spermacoce tenuior is a common weed throughout tropical America. It is probably common in Panama but has not been well collected. Steyermark (1974) has a good description of the flower: "Calyx and hypanthium 3.2–3.5 mm long at anthesis; hypanthium narrowly turbinate, 2.2 mm long, 1 mm wide, glabrous. Lobes of the calyx 4, unequal, lanceolate to linear lanceolate, acuminate or acute, one slightly larger, 0.5–0.9(–1.2) mm long, ciliolate on the lower margins where they join the lobes of the calyx but glabrous above and on most of the margins; corolla white, rotate, 1.5–2 mm long; lobes narrowly ovate to lance oblong, obtuse at the curved, cucullate apex, 0.8–1.2 mm long, 0.4 mm wide, glabrous outside, pilulose within toward the middle, longer than the tube; stamens included, reaching the mouth; the anthers ovate oblong, rounded at the base, 0.5 mm long, the filaments attached near the middle of the corolla tube, 0.2–0.3 mm long; style 0.5 mm long."

CANAL ZONE: Barro Colorado Island, *Woodworth & Vestal 476* (MO). PANAMÁ: 5–6 mi E of Chepo, Panamerican Highway, *Duke 4030* (MO). Chagres, *Fendler 147* (MO). Between Pacora and Chepo, *Woodson et al. 1660* (MO). SAN BLAS: E of Puerto Obaldía, *Croat 16930* (MO).

81. STACHYARRHENA

Stachyarrhena Hook. in Hook., Ic. Pl. 1068. 1870. TYPE: *S. spicata* Hook. f.

Dioecious *trees*, unarmed, the branchlets glabrous. *Leaves* lanceolate, the lateral veins scarcely evident, strongly coriaceous, shiny, smooth, glabrous; petioles rigid, stipules connate, collar shaped, coriaceous, truncate, without teeth or lobes. *Flowers* terminal, the female flowers solitary, the male flowers sessile, pedicellate, disposed in a stiff narrow spike of well spaced, several flowered clusters, calycine cup thick, glabrous, the lobes obsolete, the margin erosulose; corolla short, carnose, glabrous, the lobes carnose, shorter than the tube. *Fruits* capsular, the pedicels nodding, elongate; capsule large, oblong, round in cross

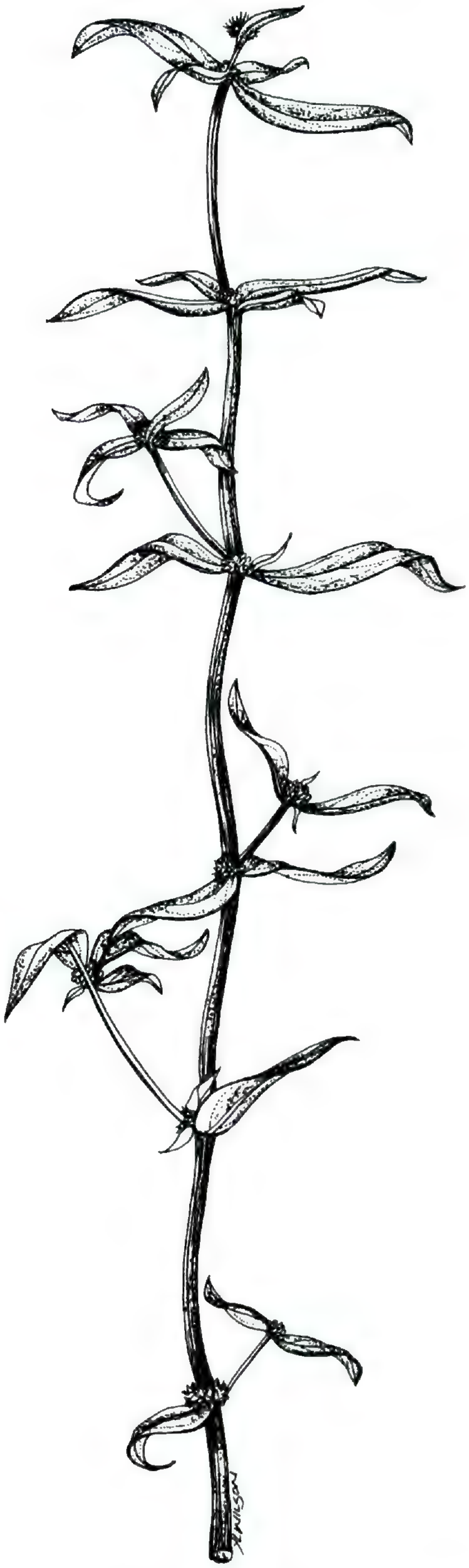

FIGURE 93. *Spermacoce tenuior* L. Habit (×.65) [After *Croat 16930.*]

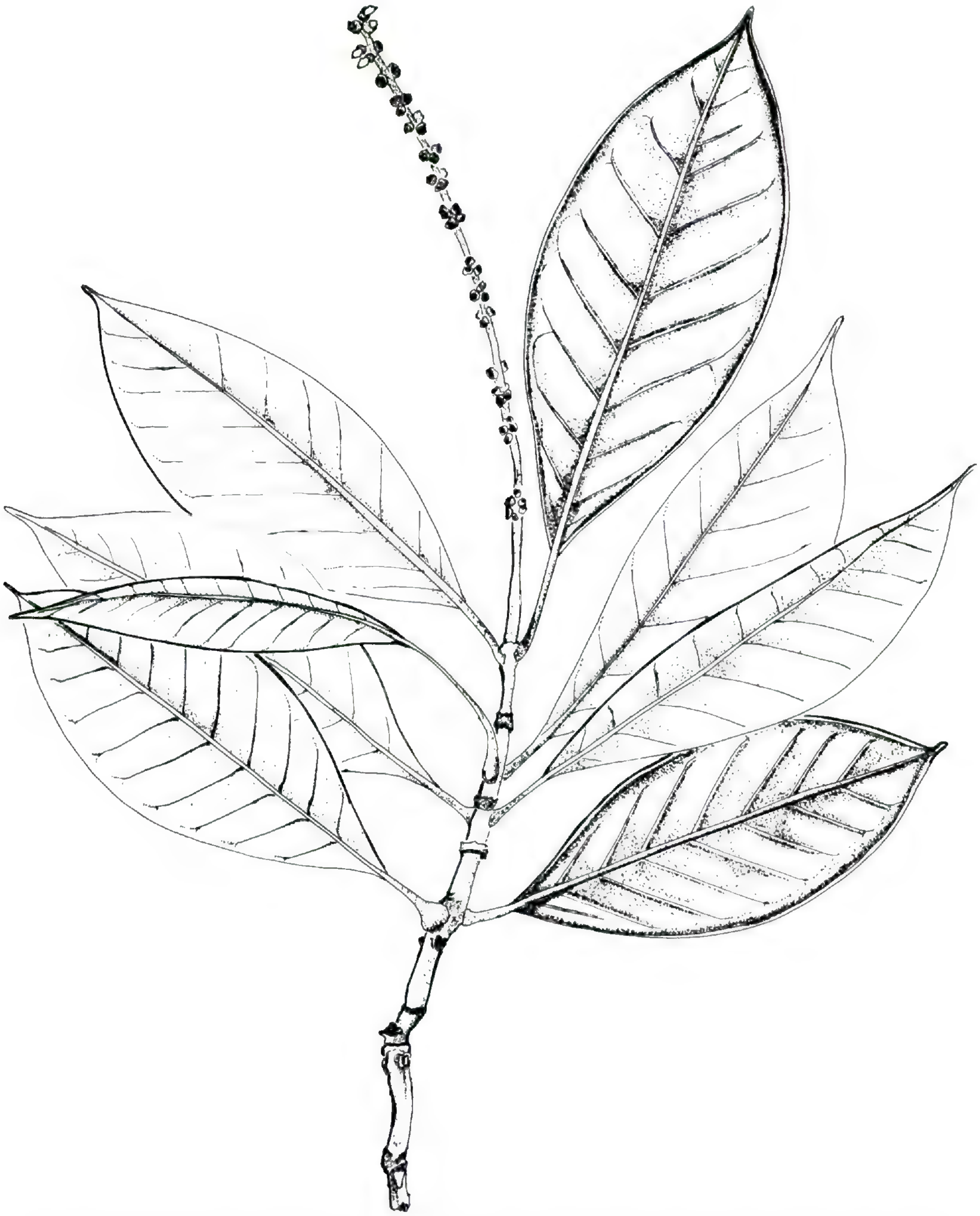

FIGURE 94. *Stachyarrhena dichroa* Standley, staminate plant. Habit (×½). [After *Lao et al. 1.*]

section, resembling a smooth squash, the wall fleshy, lignose on drying; seeds numerous in a jellylike pulp.

Stachyarrhena is known from Panama, Venezuela, Colombia and Brazil. The genus has about 8 species. The plate appearing with the original description of the genus beautifully illustrates the fruit.

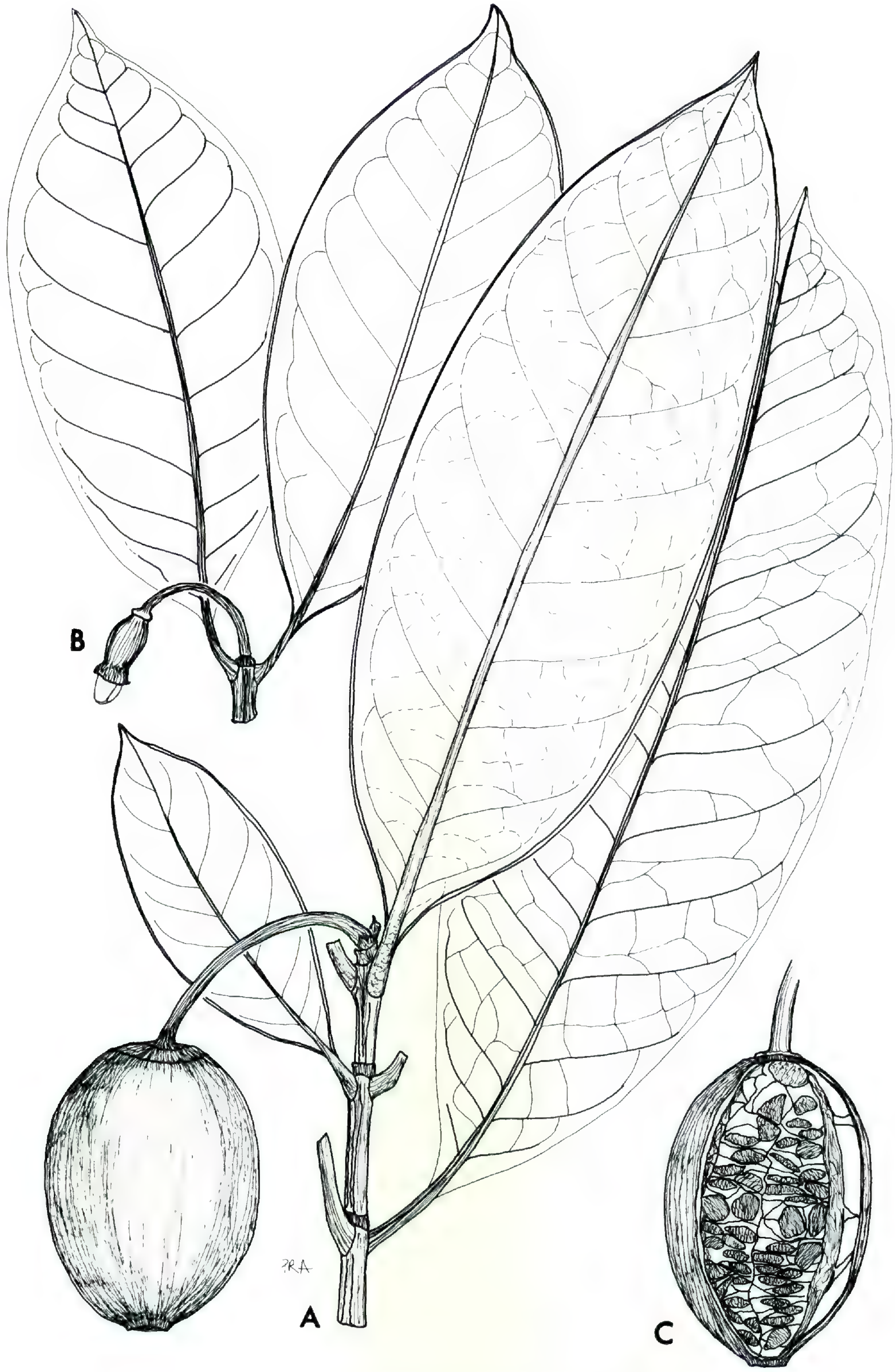

FIGURE 95. *Stachyarrhena dichroa* Standley, pistillate plant.—A. Habit with fruit (×½).—B. Flower bud with leaves (×½).—C. Fruit opened to show seed (×½). [After *Gentry 1894*.]

1. **Stachyarrhena dichroa** Standley, Contr. U.S. Natl. Herb. 18: 142. 1916. TYPE: Panama, *Pittier 4078* (US, holotype).—FIGS. 94, 95.

Trees 7–15 m tall, the branchlets glabrous, the wood hard, the twiglets smooth, glabrous, the nodes well spaced, the pairs of scars spirally disposed. *Leaves* lanceolate, 9–25 cm long, 5.0–9.5 cm wide, deltoid or obtuse toward the apex, acuminate, the acumen to 1.5 cm long, falcate toward the apex, basally cuneate, often slightly inequilateral, the costa prominulous to subplane above, prominent beneath, often with a ridge, the lateral veins 8–15, prominulous, at first arising strictly, then arcuate toward the margin, with a strongly undulate submarginal vein ca. 0.2–1.2 cm in from the margin, the intervenal areas lightly reticulate, the margin slightly revolute, strongly coriaceous, shiny, smooth, slightly discolorous, often drying brown, glabrous; petioles woody, rigid, to 2.5 cm long, to 0.35 cm wide, slightly turgid; stipules persistent, conspicuously connate, collarlike, rigid, strongly appressed to the stem, to 0.4 cm long, conspicuously truncate. Male *inflorescences* terminal, glabrous, spikelike, to 23 cm long, to 1 cm wide; peduncles 1.5–3.0 cm long, the rachis contorted, the flowers in sessile, well spaced clusters, 2–4 per cluster, occasionally solitary. Female *inflorescences* terminal, solitary flowers on rigidly lignose pedicels, these slightly flexuous, black, glabrous, to 2.5 cm long, angular and twisted, ca. 0.2 cm wide, slightly expanded at the apex, the basal bract urceolate, stipule-like, ca. 0.4 cm long, 0.2 cm wide, glabrous. Male *flowers* sessile; hypanthium scarcely measurable, the calycine cup bowl shaped, to 1.5 mm long, glabrous, coriaceous but somewhat thin walled, truncate, the teeth absent, eglandular within; corolla white, green, pink or lavender outside, often purplish pink within, to 8 mm long, the tube longer than the lobes, the lobes 4(–5) triangular oblong, obtuse or subacute, coriaceous, glabrous outside, densely pubescent within. Female *flowers* with the hypanthium oblong, to 1.5 cm long, ca. 0.8 cm wide, obtuse toward the base, hard, black, constricted toward the apex, the calycine cup urceolate, glabrous, the lobes absent or with the margin slightly erosulose or the lobes to 0.2 mm long; corolla with the tube yellow or white, short, carnose. *Fruits* on rigid, deflexed, woody, smooth pedicels, to 7.5 cm long, to 0.35 cm wide, black brown when dry, the capsule purple to brown in the living state, oblong, to 7 cm long, to 5 cm wide, round in cross section, generally resembling a small squash, smooth, glossy, black brown when dry, with a round, craterlike depression at the apex, to 1 cm in diam., ca. 2 mm wide, the wall lignose, to 1.5 mm thick; seeds many in a jellylike pulp.

Stachyarrhena dichroa is known only from Panama. The inflorescence bearing male flowers is strikingly different from the female twiglets with their solitary flowers. Pittier, who collected the type of *S. dichroa*, describes the fruit as "the color of a cherry."

COLÓN: Santa Rita Ridge, *Croat 15351* (MO); *Gentry 1894, 6567* (both MO); *Lao et al. 1* (MO). El Llano-Cartí Road, 8–11 km from the Interamerican Highway, *Mori 7714* (MO). Santa Rita Ridge, 17–35 km from Boyd-Roosevelt Highway, *Mori & Crosby 6304* (MO). Forest, Loma de la Gloria near Fató, *Pittier 4078* (F, US). DARIÉN: Demartaganala (Summit Camp), *Duke 15833* (MO). PANAMÁ: Road from El Llano to Cartí, about 14 km from highway at Chepo, *Correa et al. 1834, 1836* (both MO). SAN BLAS: El Llano-Cartí Road, 24.5–25 km from the Interamerican Highway, *Mori & Kallunki 5519* (MO).

82. TOBAGOA

Tobagoa Urban, Feddes Repert. Spec. Nov. Regni Veg. 14: 341. 1916. TYPE: *T. maleolens* Urb.

Herbs, the stems somewhat angular, glabrous. *Leaves* lanceolate, the few lateral veins strongly ascending near the margin, glabrous; petioles obvious; stipules connate, the sheath with 3 setas. *Inflorescences* axillary, capitate; bracts suborbicular with numerous segments. *Flowers* with calycine teeth 4, subequal; corolla rotate infundibuliform, densely pubescent outside, the lobes 4, valvate; stamens 4, the anthers oval; ovary 2-celled, with a single ovule per cell, attached to the upper part of the septum. *Fruits* vaguely didymous, the calyx persistent; seeds obovate, concave ventrally, delicately reticulate.

Tobagoa, a monotypic genus, is known from Panama, Tobago, and the north coast of Venezuela.

1. **Tobagoa maleolens** Urban, Feddes Repert. Spec. Nov. Regni Veg. 14: 343. 1916. TYPE: Tobago, *Eggers 5783* (B, not seen).—FIG. 96.

Diodia ottonis Schum. ex Pittier, Pl. Usual. Venez. 338. 1926. TYPE: not seen.

Herbs to 1 m tall, the stems strawlike, glabrous, angular, delicately winged, the nodes well spaced. *Leaves* lanceolate or ovate lanceolate, 6.5–10.0 cm long, 1–2 cm wide, attenuate at the apex, ultimately acute, cuneate at the base, the costa plane to immersed above, prominulous beneath, the lateral veins ca. 7, scarcely evident above, prominulous beneath, at first leaving the costa widely and arcuately then toward margin strongly ascending, the submarginal vein ca. 1 mm from the margin, inconspicuous, the margin delicately revolute, the intervenal areas smooth, the veinlets not evident, chartaceous, sometimes discolorous, glabrous; petioles slender but rigid, to 1 cm long, glabrous, attached but not conspicuously so to the stipular sheath; stipules connate, to 3 mm long, each part of the sheath with 3 setas exceeding its length. *Inflorescences* compressed capitate, axillary, to 0.5 cm long. *Flowers* with the hypanthium and calycine cup short, the calycine lobes 4, ovate triangular, 1 mm long, acute, glabrous, with a minute gland in the sinus; corolla white, the tube and lobes 3 mm long, the tube puberulent outside, villose upwards within, the lobes 4, longer than tube; stamens 4, the anthers oblong, 1 mm long, obtuse, minutely apiculate, the filaments short; style 2 mm long (in bud), papillose, the stigmas 2, curved and reflexed, to 0.4 mm long. *Fruits* dry, indehiscent, oblong, ca. 2 mm long, vaguely didymous, glabrate, the calyx persistent; seeds ventrally concave, finely reticulate.

Tobagoa maleolens is known from Panama, Tobago, the West Indies and Venezuela. Only one Panamanian collection was available for study. The fruit seems glabrate. Steyermark's (1974) recently published plate on p. 1836 shows the ovules attached basally while his generic description (loc. cit. p. 1835) says the ovule is adherent to the upper part of the septum.

COCLÉ: North rim of El Valle de Anton, 600–1000 m, *Allen 1666* (GH, MO).

FIGURE 96. *Tobagoa maleolens* Urban.—A. Habit (×¾).—B. Node (×2¼). [After *Allen 1666*.]

83. TOCOYENA

Tocoyena Aubl., Hist. Pl. Guiane 1: 131. 1775. TYPE: *T. longiflora* Aubl.

Trees or shrubs. *Leaves* opposite or ternate, often drying black; stipules interpetiolar, free or connate, persistent. *Inflorescences* terminal or subterminal, cymose corymbose or capitate, the cymes often 1 sided. *Flowers* with the hypanthium obovoid or cylindrical turbinate, the calycine cup short, the teeth 5–6, reduced, persistent in the fruit; corolla large funnelform or hypocrateriform, usually hairy at the mouth, the lobes 5, contorted in bud; stamens exserted, the anthers dorsifixed, acuminate at the apex, the filaments very short, attached at the corolla mouth; ovary 2-celled, the ovules numerous, the placenta axile. *Fruits* baccoid, oblong or ovoid, the pericarp thick, the seeds numerous horizontal and embedded in a pulp, compressed, the testa foveolate.

Tocoyena is known from Panama and tropical South America. It also occurs in the West Indies (fide Willis, 1966). There are about 20 species in the genus.

Literature:

Dwyer, J. D. 1969. *Borojoa* and *Tocoyena* (Rubiaceae) in Panama. Phytologia 17(6): 445–449.

1. **Tocoyena pittieri** (Standley) Standley, Contr. Arnold Arbor. 5: 151. 1933.—FIG. 97.

Posoqueria pittieri Standley, J. Wash. Acad. Sci. 18: 167. 1928. TYPE: Panama, *Pittier 6635* (US, holotype).

Tocoyena cuatrecasasii Steyermark, Act. Biol. Venez. 4(1): 113. 1964. TYPE: Colombia, *Cuatrecasas 1918*.

Trees to 10 m tall or much taller (fide Croat), the branchlets terete, smooth but often nodose, glabrous, the nodes usually 2–3 cm apart. *Leaves* elliptic, to 32 cm long, to 17 cm wide, widely deltoid to somewhat rounded at the apex, shortly acuminate, the acumen to 1 cm long, ultimately obtuse, cuneate toward the base, often somewhat inequilateral, the lateral veins ca. 10, arcuate, the lesser veins slender, irregular and spreading, pinnatiform, plane, stiffly chartaceous, black brown when dry, glabrous except the minutely pubescent axils of the principal veins beneath, minutely papillate under magnification, lightly marcescent above; petioles to 3 cm long, ca. 0.25 cm wide, glabrous; stipules free, triangular, 5–10 mm long. *Inflorescences* cymose paniculate, resembling a candelabra, to 13 cm long, ca. 11.5 cm wide, the flowers numerous, erect; bracts and bracteoles triangularly subulate, 0.5–1 mm long. *Flowers* pedicellate, the pedicels 1–3 mm long; hypanthium oblong, to 4 mm long, truncate, glabrous, the calycine cup ca. 1 mm long, eglandular within, the teeth 5, widely triangularly subulate, to 0.5 mm long, glabrous; corolla yellow, the tube narrowly cylindrical, 8–12 cm long, to 0.6 cm wide, thickly carnose, glabrous outside, within white villous at the base of the tube, the lobes 5, forming an ovate rotund mass in bud, golden farinose outside, ovate elliptic, obovate or elliptic rotund, 1–1.5 cm long, glabrous; stamens 5, exserted, sessile, the anthers elliptic, ca. 6 mm long, ca. 2 mm wide,

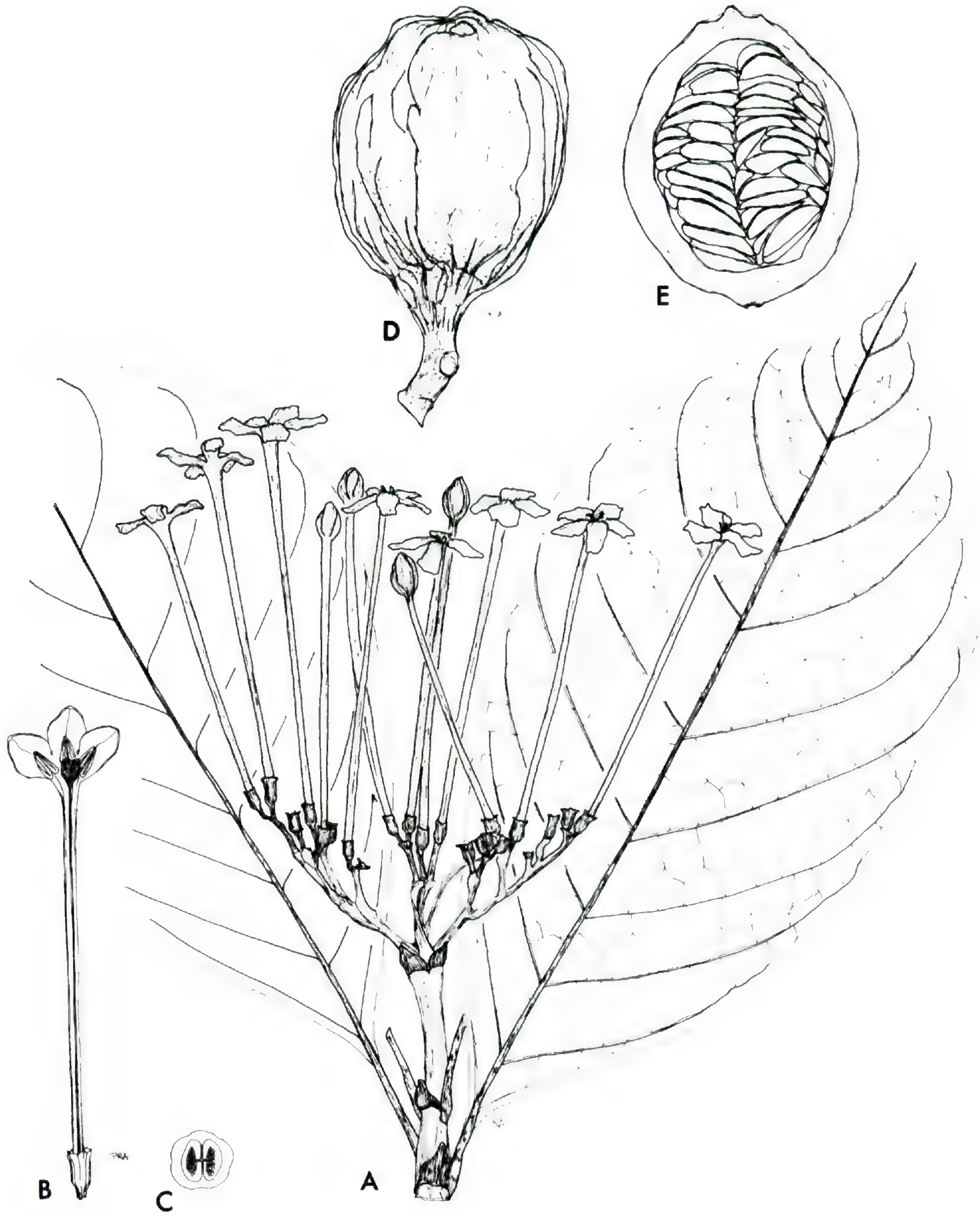

FIGURE 97. *Tocoyena pittieri* (Standley) Standley.—Inflorescence with leaves (×$^{2}/_{5}$). [After *Kirkbride & Duke 1386.*]—B. Flower (×$^{3}/_{5}$).—C. Ovary cross section (×$2^{2}/_{5}$). [After *Croat 4636.*]—D. Fruit (×½). Fruit opened to show seeds (×½). [After *Duke 15599.*]

attached at the corolla mouth; style slender, ca. 0.6 mm wide, the stigmas ovate–lanceolate, crassate, ca. 5 mm long. *Fruits* sessile, solitary, subrotund, 6–10 cm in diam., woody when dry, the wall thick, to 1.3 cm wide, drying black outside, tan within, the pulp blue black when dry, smooth externally except longitudinally costate, the ribs 10–15, well spaced, slender or thick, prominent but not ridge-

like, often evanescing along their length, the surface often marked by lenticels; seeds flat, ovate trapeziform, to 2 cm long, to 1.3 cm wide, slimy to touch.

Tocoyena pittieri is known only from Panama. *Kirkbride and Duke* (*1368*) note: "anthers white, reflexed with the petals; seeds embedded in a brownish-black pulp with somewhat the odor and taste of molasses."

CANAL ZONE: Summit Garden, *Lindsay 322* (MO, US). Trinidad River near Hydrographic station, *Pittier 6635* (US). BARRO COLORADO ISLNAD: *Aviles 14* (MO); *Croat 4636, 8529* (both MO); *Hladik 138* (MO), *299* (MO, US); *Shattuck 671* (MO); *Starry 131* (MO); *Wetmore & Abbe 197* (MO); *Woodworth & Vestal Zetek 3536* (MO). DARIÉN: Rio Ucurganti, *Bristan 1185* (MO). La Boca de Pirre, *Bristan 1246* (MO). Río Yape, *Bristan 1399* (MO). Trail from Cerro Mali to Río Pucro, 650–1200 m, *Gentry et al. 16970* (MO). Río Balsa near Río Cuasi, *Kirkbride & Duke 1386* (MO). Río Balsa near Cerro Campamento, S. Cerro Pirre cloud forest, *Duke 15999* (MO). PANAMÁ: La Cuesta, Panama City, *Holdridge 5614* (MO).

84. UNCARIA

Uncaria Schreb., Gen. Pl. 1: 125. 1789. Nomen cons. TYPE: *U. guianensis* (Aubl.) J. F. Gmelin.

Ourouparia Aubl., Hist. Pl. Guiane 1: 177. 1775. TYPE: *O. guianensis* Aubl.
Agylophora Neck., Elem. Bot. 1: 145. 1790. TYPE: not indicated.
Uncinaria Reichbach, Nom. 230. 1840. TYPE: not given.

Vines or sprawling shrubs, armed with recurved spines (aborted peduncles). *Leaves* opposite, the stipules interpetiolar. *Inflorescences* axillary and terminal, numerous, in globose heads. *Flowers* 5-merous, the hypanthium spindle shaped or turbinate, the calyx lobes valvate; corolla funnelform, pubescent outside, glabrous within, the lobes 5, valvate; stamens 5, the anthers oblong, sagittate at the base, the filaments short, inserted at the mouth; ovary 2-celled, the style slender, the stigmas small, capitate, the ovules numerous, ascending, the ovarian disc obsolete. *Fruits* capsular, septicidally dehiscent, each valve splitting at the apex; seeds numerous, imbricate, winged, the wing frequently split.

Uncaria, a genus of about 60 species, occurs in the tropics of the Old and New Worlds. In the New World it occurs in Central America, Trinidad, and tropical South America.

1. **Uncaria tomentosa** (Willd.) DC., Prodr. 4: 349. 1830.—FIG. 98.

Nauclea tomentosa Willd. in Roem. & Schult., Syst. Veg. 5: 221. 1819.
N. aculeata H.B.K., Nov. Gen. Sp. Pl. 3: 382. 1819, not Willd. 1797.
Ourouparia tomentosa (Willd.) Schum. in Mart., Fl. Bras. 6(6): 132. 1889.

Vines, often in forest canopy, the stems quadrangular, minutely puberulent, armed with subnodal spines, the spines uncinate, stiff, lignose, to 2 cm long, 0.4–0.6 cm wide proximally. *Leaves* oblong or ovate oblong, 9–17 cm long, 4.3–9.0 cm wide, tapering acutely or occasionally widely deltoid or rounded at the apex, obtuse, truncate, often vaguely cordate at the base, the costa prominulous above, prominulous to prominent beneath, the lateral veins 8–10, arcuate, angular, chartaceous or papyraceous, usually discolorous, minutely pubescent on the veins above, beneath usually densely and finely golden puberulent with fewer larger hairs intermixed, or often sparsely puberulent, the hairs confined to the costa,

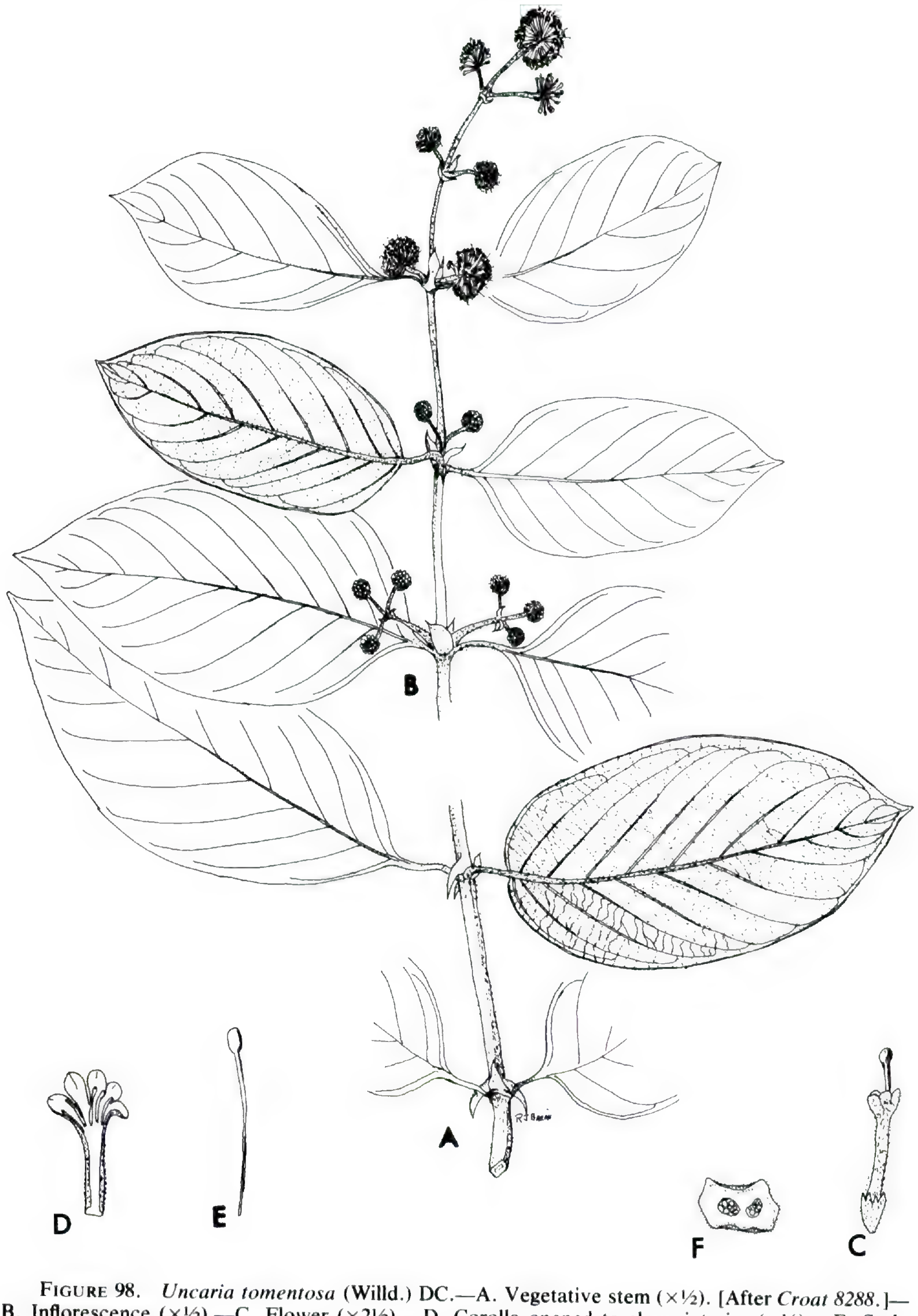

FIGURE 98. *Uncaria tomentosa* (Willd.) DC.—A. Vegetative stem (×½). [After *Croat 8288.*]—B. Inflorescence (×½).—C. Flower (×2½).—D. Corolla opened to show interior (×½).—E. Style (×3½).—F. Ovary cross section (×2½). [After *Gentle 1578*, Belize.]

veins and venules, the intervenal areas patulous reticulate; petioles to 1.5 cm long, 0.1–0.35 cm wide, tomentose; the stipules triangular, ca. 1 cm long, ca. 1.2 cm wide at base, acute, stiff, drying rubescent, with appressed white hairs. *Inflorescences* axillary, to 9 cm long, the peduncles 1.0–3.5 cm long, 0.8–3.0 mm wide, simply terminating in a globose capitulum of flowers, or the axes with 2 pairs of branches, these opposite, perpendicular, well spaced, puberulent, each terminated by a rotund capitulum, ca. 2 cm in diam. *Flowers* yellowish; hypanthium oblong, to 1.5 mm long, carnose, puberulent, the calycine cup urceolate, ca. 0.65 mm long, densely white villose within, pubescent outside, the 5 teeth disposed as points; corolla with the tube funneliform, ca. 5 mm long, ca. 0.6 mm wide, petaloid, puberulent inside and out, the lobes 5, reflexed, oblong rotund, 1.4–1.7 mm long, glabrous on the adaxial face; stamens 5, the anthers oblong, 1.1–1.5 mm long, sessile, attached near the mouth; ovary 2-loculate, the septum moderately thin, the style linear, far exserted, ca. 4.5–6.0 mm long, the stigmas clavate, 1.0–1.5 mm long. *Fruits* septicidally bivalvate, narrowly ovate oblong, to 6 mm long, the persistent calyx coroniform, ca. 1 mm long and wide, drying tan, vaguely longitudinally striate, covered with dense white hairs, the seeds linear fusiform, to 4 mm long, the body ca. 1 mm long, the wing narrower than the body, membranous, 1 end linear oblong, the other deeply cleft and biaristate.

This species is known from Nicaragua, Panama, Colombia, Venezuela, Guiana, Ecuador, and Trinidad.

Duke (*14554*) notes that the vine is called "Bejuco de Agua" . . . from which we drank water. "Tua juncara" (Choco). "Rangaya" (Changuinola Valley).

PANAMÁ: BOCAS DEL TORO: Changuinola River, *Stork 150* (US). CANAL ZONE: Pipeline Road, 4 mi N of Gamboa, *Gentry 6051* (MO). Fort Sherman, *Hayden 108* (MO). Gatún River Valley, *Pittier 6509* (US). Fort Sherman, *Standley 30948* (US). Pipeline Road, N of Gamboa, *Wilbur & Weaver 11228* (MO). BARRO COLORADO ISLAND: *Carleton 82* (US); *Croat 4661, 5504, 6013A, 8288* (all MO); *Hladick 269* (MO); *Kenoyer 543* (US); *Standley 31274* (US); *Wetmore & Abbe 133* (MO); *Wilson 72* (MO). DARIÉN: Interamerican Highway, ca. 1 mi SE of Río Tuira, *Duke 14554* (MO). PANAMÁ: Río Tapia, *Standley 26161* (US). COLOMBIA: CHOCO: Hydro Camp 11, Río Salaqui, 6 days upstream from Río Sucio, *Duke 11385* (MO).

85. WARSZEWICZIA

Warszewiczia Klotzsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 496. 1853. TYPE: *W. coccinea* Kl.

Trees or shrubs. *Leaves* large, petiolate; stipules large, glandular within at the base. *Inflorescences* terminal, cymose, the cymes arranged in racemose panicles. *Flowers* 5-merous, the hypanthium oblong ovoid, the calycine cup with lobes subequal, or 1 disposed as a stalked foliaceous limb; corolla funnelform, villous within, the lobes imbricate, 2 of them exterior; stamens with the anthers dorsifixed, versatile, exserted; ovarian disc annular, the style included or exserted, the stigmas 2, short, the ovary 2-celled, the ovules numerous, the placenta adnate to the septum. *Fruits* capsular, septicidally bivalvate; seeds numerous in 2 cells, horizontal, 3-angulate, marginate, reticulate.

Warszewiczia occurs in Mexico, Central America and tropical South America. It is a genus of 4 species.

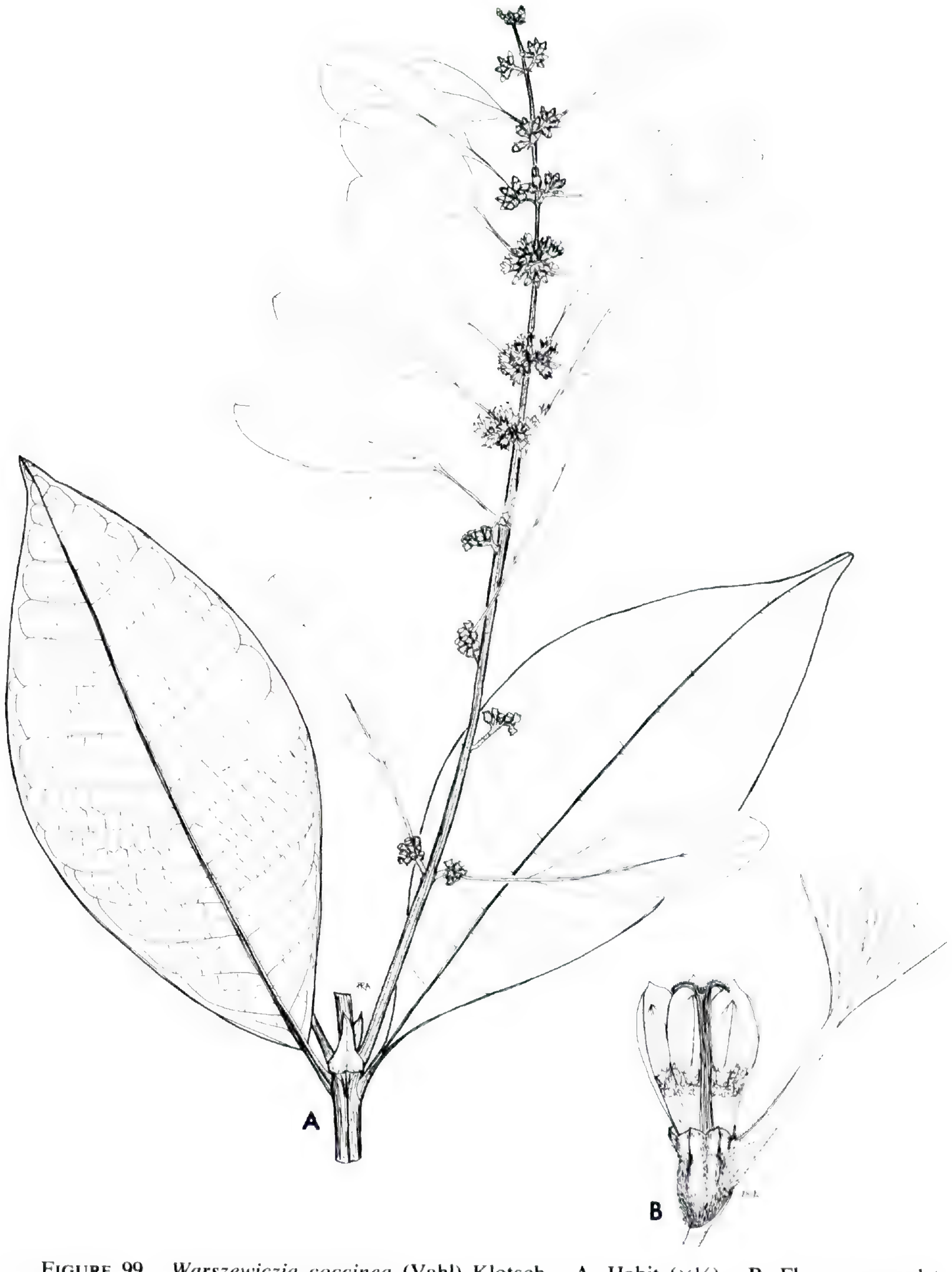

FIGURE 99. *Warszewiczia coccinea* (Vahl) Klotsch.—A. Habit (×½).—B. Flower opened to show interior (×6). [After *Shattuck 979.*]

1. **Warszewiczia coccinea** (Vahl) Klotsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 497. 1853.—FIG. 99.

Macrocnemum coccineum Vahl, Symb. Bot. 2: 38. 1791. TYPE: not seen.
Mussaenda coccineum (Vahl) Poir. in Lam., Encycl. Méth. Bot. 4: 394. 1797.
Calycophyllum coccineum (Vahl) DC., Prodr. 4: 367. 1830.

Warszewiczia pulcherrima Klotsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 497. 1853. TYPE: Panama ("Verugua"), *Warszewicz*, not seen.

Trees to 12 m tall, the branches stout, angular, drying brown or black brown, relatively smooth, rimose, minutely puberulent to appressed pilose. *Leaves* oblong, 5–45(–60) cm long, 10–20(–23) cm wide, tapering acutely or deltoidly at the apex, acuminate, the acumen to 2 cm long, the costa plane or prominent above, prominent beneath, the lateral veins 15–24, widely arcuate or arising from the costa almost perpendicularly, stiffly papyraceous, glabrate above, puberulent on the veins beneath; petioles 2–5 cm long, 0.8–1.1 cm wide, acute, golden puberulent, striate. *Inflorescences* terminal, to 60 cm long, the cyme usually subrotund or flabellate in appearance, disposed as a racemiform panicle, the clusters 1.5–5.5 cm apart; peduncles suppressed or to 2.5 cm long. *Flowers* with the hypanthium compressed rotund, ca. 1 mm long, the hairs dense, tawny, appressed, the calycine cup somewhat shorter than the hypanthium, its hairs often deciduous, the lobes 5, rotund, ca. 0.5 mm long, at least 1 flower in the cyme with an enlarged lobe, the lobe red, foliose, long stipitate, elliptic calycine to 12 cm long, to 4 cm wide, the blade usually slightly longer than the stipe, venose, glabrescent; corolla orange red, yellow or orange, 6–8 mm long, the tube short, cylindrical, expanded toward the apex, a little longer than the lobes, thickly petaloid, glabrous or glabrescent outside, pubescent within at the point of filament attachment, the lobes 5, oblong or oblong rotund, 3 mm long, rounded, truncate or attenuate toward apex; stamens 5, the anthers oblong, ca. 1.6 mm long, petaloid, acuminate at the apex, the filaments subulate, 3 mm long, villose at the base; style crassate, to 5.5 mm long, the stigmas 2, rotund, exserted from the corolla. *Fruits* capsular, septicidally dehiscent, pilosulose; seeds to 1 mm long.

Warszewiczia coccinea ranges from Nicaragua south to Bolivia. It is also found in Trinidad. *Stern et al.* (*89*), in noting the common name "Sangrenaria," add that the plant is used for hemorrhage. The flowers are protogynous and develop acropetally. *Folsom 2599* notes visitation by hummingbirds. "Guna," "Crucero," "Sangrenaria."

CANAL ZONE: 1 mi N of Summit Garden, *Blum et al. 2336* (MO). Pipeline Road near Gamboa, *Clewell & Tyson 3318* (MO). Summit Garden W of Highway, *Croat 15010* (MO). Pipeline Road 3 mi from Gamboa gate, *Croat 16605* (MO). Agua Sucia, *Fairchild* (F). Frijoles, *Ebinger 316* (F). C-29 road, near Gatún, *Harvey 5281* (F). Gamboa, *Stephens 1073* (F, US). BARRO COLORADO ISLAND: *Aviles 14, 15* (both MO), *979* (F); *Croat 6032, 7340, 9923, 10278, 15010, 15562* (all MO); *Hayden 48* (MO); *Shattuck 979* (MO, US); *Starry 271* (F, MO). CHIRIQUÍ: San Félix to Cerro Flor, *Allen 1954* (F, MO). Vicinity Remedios, *Allen 3664* (F). Tolé, Transisthmian Highway, ca. 50 mi W of Santiago, *Dwyer & Hayden 7761* (GH, K, MO, UC, US). COCLÉ: El Valle, *Dwyer 1912* (MO, US), *2109* (MO). Boca del Toabre, *Lewis et al. 5490* (MO, SCZ, UC). El Valle, *Luteyn & Kennedy 1686* (F); *Seibert 427* (F). COLÓN: Vicinity Guasimo, *Croat 9923* (MO). Río Salud, *Howell 127* (MO). 2–3 mi up Río Guanche, *Kennedy & Foster 2131* (MO). Río Guanche, 3–4 km above bridge, road to Portobelo, *Witherspoon & Witherspoon 8677* (MO). DARIÉN: Río Chico, near Yaviza, *Allen 5091* (F). El Río Yape, *Bristan 1390* (MO). Gold mine Cana, 500–600 m, *Croat 37672* (MO). Río Ganglon, *Duke & Bristan 374* (MO). Without other locality, *Duke 5112* (MO, US). Río Tucutí, ca. 2 hours by Piragua above Tucuti, *Duke 5274* (MO). Río Perrecenico off Río Pirré, *Duke & Briston 8228* (MO). Pinas, *Duke 10592* (MO). Manene to mouth of Río Cuasi, *Kirkbride & Bristan 1493* (MO). N slope of Cerro Pirre, *Mori & Kallunki 5426* (MO). Patiño, *Pittier 6674* (US). Bahia de Piñas, *Stern & Chambers 171* (F, MO, US). Paya, Río Paya, *Stern et al. 371* (MO, US). Cerro Piriaque, *Tyson et al. 3831* (MO). PANAMÁ: El Llano to Cartí Road, 14 km N of Panamerican Highway, 350–500 m, *Folsom et al. 1482* (MO). 5 mi SW of Cerro Brewster, *Lewis et al. 3474* (MO, SCZ, UC, VEN). SAN BLAS: El Llano to Cartí Road, 16.5 km N of Panamerican Highway, *Folsom 2599* (MO). VERAGUAS: W of Soná, *Allen 1023* (MO). Sona, *Allen 1026* (F). 55 mi W of Santiago, *D'Arcy & D'Arcy 6666* (MO).

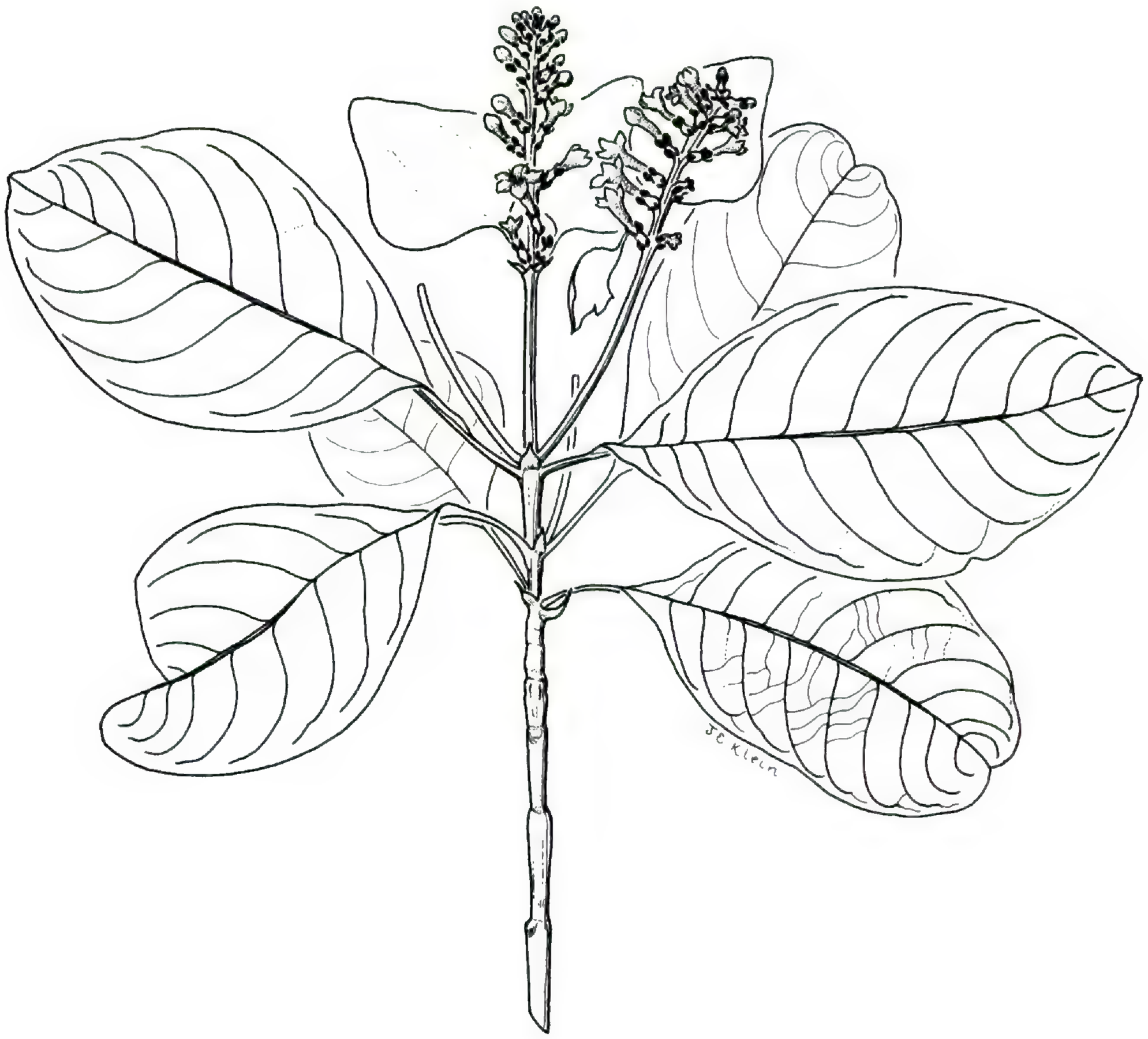

FIGURE 100. *Wittmackanthus standleyanus* (Schomb.) Kuntze. Habit (×¾). [After *Duke 8329.*]

86. WITTMACKANTHUS

Wittmackanthus Kuntze, Rev. Gen. Pl. 1: 302. 1891. TYPE: *W. stanleyanus* (Schomb.) Kuntze.—FIG. 100.

Pallasia Klotzsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 498. 1853; not *Pallasia* Hout. 11: 832. 1775, Cucurbitaceae; not *Pallasia* Scop. Introd. 72. 1777, Gramineae; not *Pallasia* L.f., Suppl. 37. 1781, Polygonaceae; not *Pallasia* L'Her. ex Ait., Hort. Kew III: 498. 1789, Compositae.

Trees or *shrubs*. *Leaves* opposite, petiolate; stipules free, small, interpetiolar. *Inflorescences* terminal and axillary, spicate. *Flowers* 4–6-merous; hypanthium short; calycine cup short, the lobes 4–6, variable in length; corolla tubular, variable in length, the lobes imbricate; stamens 5, unequal, the anthers versatile, attached near the mouth; ovary 2-celled, the ovules numerous, vertically imbricate, alate, the placentas carnose. *Fruits* capsular, septicidally dehiscent, the calyx persistent, the seeds winged.

Wittmackanthus is known from Panama and northern South America south to Peru. The genus is monotypic.

Literature:

Steyermark, J. A. & J. Kirkbride, Jr. 1975. The genus *Wittmackanthus* (Rubiaceae). Ann. Missouri Bot. Gard. 62: 504–509.

1. **Wittmackanthus stanleyanus** (Schomb.) Kuntze, Rev. Gen. 1: 302. 1891.

Calyocophyllum stanleyanum Schomb., J. Bot. 3: 622. 1844. TYPE: Guyana, *Schomburgk 356/411 B* (K, not seen; photo, MO; NY, isotype).
Pallasia stanleyana (Schomb.) Klotzsch, Monatsber. Königl. Preuss. Akad. Wiss. Berlin 498. 1853.
Rondeletia dukei Dwyer & Hayden, Ann. Missouri Bot. Gard. 54: 144. 1967. TYPE: Panama, *Duke 8329* (MO, holotype; NY, isotype).

Shrubs or *trees,* the branchlets purple or red, glabrous but often ciliolate above the nodes. *Leaves* elliptic oblong or widely oblong, 4–13 cm long, 2.0–5.5 cm wide, deltoid, acute, obtuse or rounded at the apex, if acuminate the acumen to 1 cm, cuneate at the base, the costa slender, prominulous beneath, the lateral veins ca. 9, widely arcuate, patulous, forming an undulate vein near the margin or the submarginal vein not conspicuous, the intervenal areas reticulate, stiffly membranous to chartaceous, glabrous or hirsute on the costa beneath, drying grey, the margin delicately callose; petioles 1.0–4.5 cm long, wiry, stiff, glabrous, drying black; stipules triangular, to 0.6 cm long, to 0.4 cm wide, acute, glabrate or golden pubescent. *Inflorescences* terminal or axillary, spikelike, cymose; peduncle to 6.5 cm long, ca. 0.1 cm wide, glabrous, minutely farinose, the flowers either solitary or disposed in few flowered, well-spaced clusters. *Flowers* sessile or pedicellate, the pedicels to 0.3 cm long; hypanthium subrotund, ca. 1.5 mm long, densely appressed golden pilose; calycine lobes 5, oblong rotund, ca. 2 mm long, about as long as wide, the margin thin, ciliolate, the lowermost flowers with 1 or 2 calycine lobes expanded as a wide foliose ovate blade, to 4 cm long, obtuse, drying yellow; corolla white, the tube slender, to 5.5 mm long, ca. 0.8 mm wide in the middle, carnose, densely puberulent outside, sparsely ciliate at the mouth within, the lobes 5, oblong, 2–3 mm long, pubescent inside and out, obtuse, spreading at anthesis; stamens 5, the anthers oblong, 1.0–1.5 mm long, sagittate basally, versatile, the filaments unequal, as long as the anthers, attached at the mouth; ovarian disc shallow, doughnut shaped, the style slender, ca. 9 mm long, expanded just below the stigma, the latter saucer shaped, ca. 0.5 mm wide. *Fruits* sessile, narrowly oblong, to 1.2 cm long, to 0.4 cm wide, covered with a gray indumentum, somewhat plano compressed; seeds membranous, drying yellow, fusiform, to 5.5 mm long.

Wittmackanthus stanleyanus is known from Panama, Guyana, Colombia, and Peru. Steyermark and Kirkbride (1975) reduced *Rondeletia dukei* Dwyer & Hayden to synonomy under *Wittmackanthus stanleyanus*. They note: "The type collection of *R. dukei* from Panama has blades obtuse to rounded at the apex, but may have been collected from an abnormal plant. Finally, the size of the leaf blades is quite variable and has no taxonomic significance."

DARIÉN: Río Pirre, *Duke 8329* (MO, NY). Río Tuquesa, at the middle Tuquesa Mining Company Camp called Charco Peje, tropical wet forest, ca. 250 m, *Mori 7001* (MO).

87. XEROCOCCUS

Xerococcus Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 52. 1852. TYPE: Costa Rica, *X. congestus* Oerst.

Subshrubs. *Leaves* opposite, acuminate, petiolate. *Inflorescences* axillary, epedunculate, the flowers densely conglomerate. *Flowers* with the calycine lobes slender, elongate, persistent; corolla lobes 4, erect; stamens 4, the anthers ovate, the filaments short, inserted near the mouth; ovary 2-celled, the ovules numerous, horizontal, anatropous, the style slender, the stigmas 2, thick. *Fruits* baccate, ovoid, 2-celled; seeds numerous, angular.

Xerococcus is a genus of 2 species confined to Costa Rica and Panama.

1. **Xerococcus congestus** Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 52. 1852. TYPE: Costa Rica, *Oersted 11776* (F, photo MO).

Subshrubs, unbranched, to 1½ m tall, the stems terete, smooth below, blotchy terminally, the nodes well spaced. *Leaves* obovate or occasionally ovate rotund, 15–32 cm long, 10–13 cm wide, rounded at the apex, acuminate, the acumen triangular, to 0.5 cm long, ultimately obtuse, attenuate cuneate at the base, the lamina decurrent on the petiole, the wing 5–7 mm wide, the costa slender above, prominulous, plano compressed beneath, to 0.25 cm wide, the lateral veins ca. 12, arcuate, prominulous, with 1–3 small intermediate veins between adjacent lateral veins, these soon branching, the smallest veins pinnatifid, widely spaced, chartaceous, glabrous above, beneath with curled hairs, these often collapsed and giving a glandular webby appearance to costa and secondary veins; petioles narrowly winged, 5–7 cm long; stipules apparently persisting only at the apex of the stem, free, triangular, to 18 mm long, to 10 mm wide at base, coriaceous, glabrous. *Inflorescences* axillary, epedunculate, capitate rotund, to 1 cm long, to 2 cm wide. *Flowers* with pedicels short, to 2.5 mm long, golden villose; hypanthium ca. 2 mm long, the calycine cup scarcely measurable, the lobes 4, elongate, ascending digitiform, to 5.5 mm long, about equal, to 0.4 mm wide, stiff, villose outside, glabrous within, often with 1–2 glands between adjacent lobes, the tips often curved, obtuse, often with 1 or 2 pairs of glands on the basal margin, drying red; corolla tube cylindrical, ca. 3.5 mm long, ca. 1 mm wide, glabrous inside and out, the lobes 4, triangular oblong, to 3.5 mm long, to 1 mm wide at the base, thick, puberulent on the back; stamens 4, the anthers subsessile, ca. 1.2 mm long, attached at the mouth; style 3.5 mm long; stigmas 2, apparently upright, somewhat triangular, wider than the style; ovary 2-celled, the ovules numerous. *Fruits* oblong rotund, to 6 mm long, smooth, white, also on drying, the calyx persistent; seeds compressed, angular, square, hemispherical or rhomboidal, ca. 0.3 mm long, reticulate, drying red.

Xerococcus congestus is known only from Costa Rica and Panama. Four collections in the Missouri Botanical Garden from Costa Rica have the wing of the petiole much reduced or absent: *Burger & Liesner 6282*; *Jiménez 622*; *Burger & Burger 7659*; *Skutch 3261*. The petioles of *Burger & Liesner 6282* are to 10 cm in length. As no fruit was seen from Panama, the above description of fruits was taken from *Croat 44491* (MO) from Costa Rica.

VERAGUAS: 14 km NW of Santa Fe, road to Calovebora, *Mori & Bolten 7653* (MO).

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Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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ANNALS
OF THE
MISSOURI BOTANICAL GARDEN

VOLUME 67 1980 NUMBER 3

FLORA OF PANAMA[1]

By Robert E. Woodson, Jr. and Robert W. Schery
and Collaborators

Part V, Fascicle 5[2]

Family 83. LEGUMINOSAE[3]

Subfamily PAPILIONOIDEAE (Conclusion)

John D. Dwyer[4] & Collaborators[5]

Trees, shrubs or herbs, occasionally armed. *Leaves* often alternate, pari- or imparipinnate, frequently 3-foliolate, rarely 1-foliolate; stipules usually present; stipelles mostly present. *Inflorescences* usually racemose or paniculate, often axillary. *Flowers* papilionaceous, rarely actinomorphic; hypanthium more or less

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[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator).

[2] Flora of Panama pagination, found in parenthesis at the bottom of pages of early treatments, was discontinued after Part V. The contents of this and other parts of the Flora should be cited as: Ann. Missouri Bot. Gard., with volume, number, pagination and date of the Annals.

[3] Continued from Ann. Missouri Bot. Gard. 52: 54. February [March 31] 1965.

[4] St. Louis University and Missouri Botanical Garden, Box 299, St. Louis, Missouri 63166.

[5] The subfamilies Mimosoideae and Caesalpinoideae of the Leguminosae were prepared by Robert W. Schery and published in the Flora of Panama, Part V, Fascicles 2 and 3; Ann. Missouri Bot. Gard. 37(2): 185–314. June 2, 1950 and 38(1): 1–94, March 22, 1951. The subfamily Papilionoideae was prepared by John D. Dwyer but for budgetary reasons, only the tribe Dalbergieae, Flora of Panama, Part V, Fascicle 4: Ann. Missouri Bot. Gard. 52(1): 1–54, March 31, 1965 was published at that time. Of the tribe Dalbergieae, the genus *Lonchocarpus* was contributed by F. J. Hermann. As more than a decade of intensive botanical study and collecting in Panama passed before it was feasible to consider resumption of publication of Dwyer's treatment, it was decided to revise the earlier treatment completely. This was done under the direction of W. G. D'Arcy working under the guidance of John D. Dwyer. This revision of the earlier manuscript enlisted the help of a number of specialists, and their contributions are identified with the groups they prepared. Except for editorial decisions agreed upon in the interest of uniformity of terminology and format, each contributor is solely responsible for his treatment. Each author is acknowledged under the genera he contributed. In addition, Michael O. Dillon, Peter S. White and James Lackey contributed largely to preparation of the key to genera and to the overall preparation of the tribes Sophoreae and Hedysareae, the Galegeae and the Phaseoleae respectively. As an aid to readers who may not have ready access to the earlier published parts of the Papilionoideae treatment, i.e., that of the Dalbergieae, the subfamily description, the relevant literature, the synoptical key to tribes are repeated here with some revision. Also,

campanulate, the teeth 5, the carinal tooth often the longest; petals 5, disposed as an upper standard or vexillum, 2 wing petals or alae, and 2 keel or carinal petals coherent apically, occasionally united in part with the wing petals and enclosing the androecium and the gynoecium, occasionally rostrate and coiled at the apex; stamens 10, rarely 9 or less, occasionally free, usually monadelphous or diadelphous, the free filaments equal or often alternating long and short, the anthers monomorphic or dimorphic; ovary 1-carpellate, often surrounded by a glandular disc, 1- to several-ovulate, the stigma capitate or lateral, often enlarged, occasionally bearded. *Fruits* mostly dehiscing along 2 sutures, often pluri-loculate by the development of septa, occasionally indehiscent and samaroid, drupaceous or lomentaceous; seeds 1–several, often arillate, exalbuminous, the radicle of the embryo curved.

Of the subfamilies of Leguminosae, the Papilionoideae, whether regarded on a world-wide basis or locally in Panama, contains the greatest number of genera and species and largest representation of plants economically important, as food, drugs, timber or dyes.

A few genera of Papilionoideae, e.g. *Clitoria, Phaseolus,* bear uncinate hairs. These minute, usually hooked trichomes usually require the aid of a lens and are best seen in silhouette by viewing the edges of surfaces.

The conspectus of the Papilionoideae presented here has been moded from the traditional concepts of older workers. Recently however, a number of innovations have been recommended. For example, Lackey (1977) recommends removal of *Pachyrhizus* from the Phaseoleae-Phaseolinae to the Diocleinae, and R. M. Polhill of Kew in a memorandum preparatory to the volume, *Advances in Legume Systematics* to be published in 1980 by the Royal Botanical Gardens Kew, recommends acceptance of several tribes not recognized here and of several shifts of genera from one tribe to another, e.g. of *Dipteryx* from the Dalbergieae to a tribe Dipteryxeae, and of *Centrolobium, Lonchocarpus, Piscidia, Muellera* from the Dalbergieae to a tribe Tephrosieae, together with *Tephrosia, Barbieria* and *Willardia* from the Galegeae; elevation of subtribe Galegeae-Indigoferinae to tribe Indigoferae; removal of *Dalea* from the Galegeae to a tribe Amorpheae; removal of *Sesbania* from the Galegeae to a tribe Sesbanieae; separation of *Desmodium* and *Alysicarpus* from the Hedysareae (Aeschynomeninae) to a tribe Desmodieae; removal of *Abrus* from the Vicieae to a monotypic tribe Abreae; removal of *Crotalaria* from tribe Genisteae to a tribe Crotalarieae, and elevation of subtribe Galegeae-Robiniinae to a tribe Robinieae but removing *Cracca* from this. Polhill does not separate *Stizolobium* from *Mucuna* but separates *Cymbosema* from *Camptosema*.

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the genera of the Dalbergieae appearing in the already published portion have been incorporated into the key to genera.

Many of the illustrations presented here were prepared in the period before 1965 and, in some cases, vouchers could not be relocated to verify determinations, localities and magnifications. Determinations for these collections were reviewed by the senior author (Dwyer) at the time the illustrations were made and it is presumed that they accord with the concepts of the various collaborating authors. All illustrations are based on material available at the time at MO.

—W. G. D'Arcy

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CONSPECTUS OF TRIBES AND SUBTRIBES[6]

a. Stamens free; leaves mostly pinnate, leaflets numerous; shrubs or trees ..... Tribe Sophoreae

2. Acosmium
5. Ateleia
21. Dussia
33. Myroxylon
34. Ormosia
40. Sophora

aa. Stamens united, at least in part; leaves and habit various.
b. Fruit articulating between the seeds ..... Tribe Hedysareae
c. Anthers all alike ..... Subtribe Desmodiinae

4. Alysicarpus
18. Desmodium

cc. Anthers dimorphic.
d. Stamens 10, the filament tube closed ..... Subtribe Stylosanthinae

42. Stylosanthes
49. Zornia

dd. Stamens 5 + 5, the filament tube open ..... Subtribe Aeschynomeninae

3. Aeschynomene
11. Chaetocalyx

bb. Fruit 2-valved or indehiscent.
e. Leaves entire or 3–5 digitate.
f. Leaflets denticulate ..... Tribe Trifolieae

45. Trifolium

ff. Leaflets entire ..... Tribe Genisteae
g. Stamens 10 with open filament tube ..... Subtribe Crotalariinae

15. Crotalaria
30. Lupinus

gg. Stamens 10 with closed filament tube ..... Subtribe Genistinae

46. Ulex

ee. Leaves pinnate.
h. Leaf terminating in a bristle ..... Tribe Vicieae

1. Abrus

hh. Leaf terminating in a leaflet.
i. Pod indehiscent ..... Tribe Dalbergieae

Published previously
(*Geoffroeae*) *Andira*
Centrolobium
Dalbergia
(*Oleicarpon*) *Dipteryx*
Fissicalyx

[6] Adapted in part from Taubert (1891), Dalla Torre and Harms (1907), and Melchior (1964).

Lonchocarpus
(*Paramachaerium*) *Machaerium*
Muellera
Piscidia
Platymiscium
Platypodium
Pterocarpus

ii. Pod mostly dehiscent.
j. Ovary surrounded by a disc ---------- Tribe Phaseoleae
k. Style glabrous (except *Clitoria*), rarely pubescent below.
l. Vexillary stamen partly united with the others.
m. Petals about equal.
n. Inflorescence rachis nodose ---------- Subtribe Diocleinae

9. Canavalia
19. Dioclea
37. Pueraria

nn. Inflorescence rachis not nodose ---------- Subtribe Glycininae

10. Centrosema
12. Clitoria
13. Cologania
44. Teramnus

mm. Either the standard or the keel much larger than the other ---------- Subtribe Erythrininae

23. Erythrina
32. Mucuna
41. Stizolobium

ll. Vexillary stamen mostly completely free.
o. Inflorescence rachis nodose; leaflets eglandular ---------- Subtribe Galactiinae

8. Calopogonium
16. Cymbosema
25. Galactia

oo. Inflorescence rachis not nodose; leaflets glandular beneath ---------- Tribe Cajaninae

7. Cajanus
22. Eriosema
24. Flemingia
38. Rhynchosia

kk. Style pubescent along the inner edge or around the stigma ---------- Subtribe Phaseolinae

28. Lablab
31. Macroptilium
35. Pachyrhizus
36. Phaseolus
47. Vigna

jj. Ovary lacking a disc ---------- Tribe Galegeae
p. Anther connective with gland, bristle or apiculum ---------- Subtribe Indigoferinae

27. Indigofera

pp. Anther connective unappendaged.
q. Ovules mostly 1–2, plants glandular punctate ---------- Subtribe Psoraleinae

17. Dalea

qq. Ovules mostly numerous; plants not punctate.
r. Inflorescence terminal or sometimes opposing a leaf ---------- Subtribe Tephrosiinae

6. Barbieria
43. Tephrosia

rr. Inflorescence always axillary ---------- Subtribe Robiniinae

14. Cracca
20. Diphysa
26. Gliricidia
29. Lennea
39. Sesbania
48. Willardia

1. Leaves all 1–2-foliolate.
   2. Trees or shrubs, leaves 1-foliolate.
      3. Inflorescences mostly equalling or surpassing the leaves; flowers included in foliaceous bracts ---- 24. Flemingia
      3′. Inflorescences much shorter than the leaves; bracts minute, the flowers exserted.
         4. Leaves more than 4 cm wide; pods more than 2 cm wide ---- *Lonchocarpus*
         4′. Leaves less than 3 cm wide; pods less than 1 cm wide ---- *Dalbergia*
   2′. Herbs, leaves 1–2-foliolate.
      5. Leaves all 2-foliolate ---- 49. Zornia
      5′. Leaves 1-foliolate or more.
         6. Leaves linear, mostly more than 8 cm long.
            7. Stems conspicuously winged by stipules; pod turgid, continuous between the seeds; flowers yellow ---- 15. Crotalaria
            7′. Stems unwinged; pod flat, the margins greatly indented between the seed segments (articles) ---- 18. Desmodium
         6′. Leaves broader, less than 7 cm long (*Indigofera lespedezioides* rarely unifoliolate).
            8. Flowers pink; pod linear, demarcated between the seeds, less than 3(4) mm wide ---- 4. Alysicarpus
            8′. Flowers yellow or blue; pod oblong, not marked between the seeds, more than 4 mm long ---- 15. Crotalaria
1′. Leaves compound, leaflets 3 or more.
   9. Plants copiously armed with spines longer than the leaves ---- 46. Ulex
   9′. Plants unarmed or with short spines.
      10. Leaves digitately 5–7 lobed ---- 30. Lupinus
      10′. Leaves 3-foliolate or pinnately 4–many foliolate.
         11. Leaves 5–many foliolate.
            12. Pod (loment) separating into articles; herbs or vines.
               13. Pod indented or crenate along one edge ---- 3. Aeschynomene
               13′. Pod nearly straight on both margins.
                  14. Leaflets 5; vines, branches twining ---- 11. Chaetocalyx
                  14′. Leaflets 7 or more; herbs, branches stiff ---- 3. Aeschynomene
            12′. Pod (loment) not separating into articles; trees, shrubs or vines.
               15. Twining vines, mostly slender; leaves odd pinnate.
                  16. Seeds red and black; leaflets less than 10 mm wide, mostly numerous; leaves terminated by a bristle ---- 1. Abrus.
                  16′. Seeds brown, not red; leaflets more than 10 mm wide, 5–7; leaves terminated by a leaflet ---- 12. Clitoria
               15′. Shrubs, trees or herbs, not twining vines.
                  17. Pods flat or winged with conspicuous flat non-seminiferous areas; seeds few (1–4); trees or shrubs.
                     18. Pods elongate, seed(s) confined to one end or side of the pod.
                        19. Seed(s) at one side of the pod.
                           20. Pod less than 25 mm long; petal; calyx subtruncate ---- 5. Atelia
                           20′. Pod more than 30 mm long; petals 5; calyx plainly toothed ---- *Pterocarpus*
                        19′. Seed(s) at one end of the pod, the remainder of the pod forming an elongate wing.
                           21. Seed at the distal end of the pod, winged proximally; flowers whitish.
                              22. Calyx subtruncate; leaflets short acuminate, pellucid punctate; stamens all free; sap clear ---- 33. Myroxylon

22′. Calyx evidently toothed; leaflets emarginate, not pellucid punctate; stamens united in fascicles; sap red ..... *Platypodium*

21′. Seed at the proximal end of the pod, winged distally; flowers yellow, blue, pink or purple, at least in part.

23. Seminiferous area covered with spines; flowers yellow; leaflets more than 40 mm wide; wing more than 3 cm wide ..... *Centrolobium*

23′. Seminiferous area unarmed; flowers blue, pink or purple, at least in part; leaflets less than 40 mm wide; wing more than 3 cm wide ..... (Paramachaerium) *Machaerium*

18′. Pods elongate to discoid, seed medial in the pod (winged or with flat areas all around).

24. Pod 4-winged; flowers pinkish ..... *Piscidia*

24′. Pod with a single wing or flat area around the seed.

25. Pods discoid.

26. Pods turning black, coriaceous to woody throughout ..... *Dalbergia*

26′. Pods remaining green or brown, with a defined papery wing area around the seed.

27. Seed area circular, the wings inconspicuously veined; anthers dehiscing by longitudinal slits ..... *Pterocarpus*

27′. Seed area narrow, the wings conspicuously veined; anthers dehiscing by terminal pores ..... *Fissicalyx*

25′. Pods elongate, oblong or narrowly elliptical.

28. Leaves opposite; flowers yellow ..... *Platymiscium*

28′. Leaves alternate; flowers variously colored.

29. Leaves with persistent subulate stipels ..... 29. Lennea

29′. Stipels wanting or caducous.

30. Leaflets alternate.

31. Leaflets with appressed puberulence beneath, venation arcuate; stamens included; pod valves reticulate only over the seed ..... *Dalbergia*

31′. Leaflets with spreading puberulence beneath, venation straight; stamens exserted; pod valves reticulate all over ..... 2. Acosmium

30′. Leaflets opposite.

32. Fruiting pedicels stout, conspicuously expanded, ca. 3 mm wide just below the calyx, more than 7 mm long ..... 26. Gliricidia

32′. Fruiting pedicels slender, scarcely expanded below the calyx, less than 6 mm long.

33. Pods tardily dehiscent, the valves with resin ducts, glabrous; style glabrous except a few minute hairs on the concave surface ..... 48. Willardia

33′. Pods indehiscent, the valves without resin ducts, mostly pubescent; style pubescent below the tip ..... *Lonchocarpus*

17′. Pod turgid, if compressed or flat then lacking thin areas around the seeds; seeds 1–many; trees, shrubs or herbs.

34. Leaves conspicuously glandular punctate beneath ..... 17. Dalea

34′. Leaves eglandular, not punctate.

35. Pod thick, drupaceous, 1–2(4) seeded, ligneous; shrubs or trees.
    36. Seeds red, at least in part; stigma lateral on the ovary; stamens free; pod dehiscent ..... 34. Ormosia
    36′. Seeds brown or black, not red; stigma terminal on the ovary; stamens at least partly connate; pod mostly indehiscent.
        37. Leaflets opposite.
            38. Leaves with stiff, persistent subulate stipels ..... (Geoffroea) *Andira*
            38′. Leaves with stipels wanting or caducous ..... *Muellera*
        37′. Leaflets alternate.
            39. Leaf rachis winged; pod indehiscent, smooth, apically rounded .... (Oleiocarpon) *Dipteryx*
            39′. Leaf rachis unwinged; pod dehiscent by conspicuous longitudinal ridges, prominently apiculate ..... 21. Dussia
35′. Pod narrow, less than 10 mm wide, few–many seeded; trees shrubs or herbs.
    40. Pod moniliform, conspicuous constrictions separating the globose seminiferous areas.
        41. Pods 5–many seeded, more than 3 cm long; leaflets more than 1.5 cm wide; hairs basifixed ..... 40. Sophora
        41′. Pods 3–5 seeded, less than 3 cm long; leaflets less than 1 cm wide; hairs medifixed ..... 27. Indigofera
    40′. Pod elongate but not conspicuously constricted between the seeds.
        42. Pod inflated and bladdery ..... 20. Diphysa
        42′. Pod valves applied, not inflated.
            43. Pod margins crenate, trees ..... *Dalbergia*
            43′. Pod margins straight, herbs or shrubs.
                44. Stipels linear, persistent.
                    45. Pods narrow, less than 4 mm wide; calyx more than 15 mm long .... 6. Barbiera
                    45′. Pods wider, more than 4 mm wide; calyx less than 15 mm long ..... 14. Cracca
                44′. Stipels wanting or caducous.
                    46. Inflorescences lateral or axillary.
                        47. Hairs medifixed; pods less than 3 cm long ..... 27. Indigofera
                        47′. Hairs basifixed; pods more than 3 cm long ..... 39. Sesbania
                    46′. Inflorescence terminal or leaf opposed ..... 43. Tephrosia

11′. Leaves 3-foliolate.
    48. Leaflets denticulate, each lateral vein protruding into a short tooth; pod included in the calyx or petals ..... 45. Trifolium
    48′. Leaflets entire or lobed, not denticulate; pod exserted.
        49. Pod inflated, not compartmented, the seeds often becoming loose and rattling inside ..... 15. Crotalaria
        49′. Pod not inflated, often with septa, cellulose or other compartmenting, the seeds not becoming loose together inside.
            50. Fruit (loment) either breaking into articles or flat, subdiscoid, 2-articulate.
                51. Stipels present; flowers rose, violet or whitish; anthers uniform ..... 18. Desmodium
                51′. Stipels wanting; flowers yellow; anthers dimorphic ..... 42. Stylosanthes
            50′. Fruit (loment) not breaking into articles, longer than broad, mostly more than 2-seeded.
                52. Trees or shrubs more than 30 cm tall.

53. Flowers large, more than 1.5 cm long.
    54. Flowers red or orange, calyx with minute teeth or none sometimes splitting to appear lobed; style glabrous; seeds often red ---- 23. Erythrina
    54′. Flowers white or yellowish with purple marking, calyx with 5 well defined teeth; style pubescent, seeds dark, not red ---- 12. Clitoria
53′. Flowers smaller, less than 1.5 cm long.
    55. Hairs medifixed; leaves eglandular; pod thin, less than 3 mm wide; anthers spurred ---- 27. Indigofera
    55′. Hairs basifixed; leaves gland dotted beneath; pod thin, more than 5 mm wide; anthers not spurred.
        56. Pod short, less than 3 cm long; seeds 2; leaves subsessile ---- 22. Eriosema
        56′. Pod elongate, more than 3 cm long; seeds more than 2; leaves petiolate ---- 7. Cajanus
52′. Vines or herbs, if woody less than 30 cm tall.
    57. Leaflets subsessile, stipels obsolete or wanting; hairs medifixed ---- 27. Indigofera
    57′. Leaflets petiolulate, stipels developed (sometimes caducous); hairs basifixed.
        58. Standard much shorter than the keel; calyces or pods often with stinging hairs.
            59. Seeds discoid ---- 32. Mucuna
            59′. Seeds rectangular to globose ---- 41. Stizolobium
        58′. Standard about as long as the keel or longer; plants lacking stinging hairs.
            60. Pod less than 2–3 times as long as wide.
                61. Seeds large, more than 12 mm long (except *D. virgata*) ---- 19. Dioclea
                61′. Seeds smaller, less than 12 mm long.
                    62. Pod large, more than 20 mm wide; flowers elongate, more than 3 cm long ---- 16. Cymbosema
                    62′. Pod smaller, less than 20 mm wide, flowers less than 2 cm long.
                        63. Stipules persistent, conspicuous; bracts pinnate.
                            64. Leaves more than 10 mm wide ---- 36. Phaseolus
                            64′. Leaves less than 10 mm wide ---- 42. Stylosanthes
                        63′. Stipules small, caducous; bracts caducous ---- 38. Rhynchosia
            60′. Pod many times longer than wide.
                65. Standard with a notch or spur on the back near the base ---- 10. Centrosema
                65′. Standard lacking notch or spur.
                    66. Calyx lobes very unequal, the upper 2 fused into a lip or hood, the lowest 3 minute; pods large, more than 2 cm wide and often becoming woody ---- 9. Canavalia
                    66′. Calyx lobes alike or somewhat unequal through fusion, the lowest teeth about as large or larger than the upper 2; pod smaller, mostly less than 2 cm wide, mostly not woody.
                        67. Fertile stamens 5, alternating with 5 staminodes.
                            68. Flowers small, less than 1 cm long; pod linear, narrow, the apex incurved hooked; racemes short, the flowers few, distant ---- 44. Teramnus
                            68′. Flowers larger, more than 1 cm long; pod oblong, the apex not hooked; racemes long, many flowered ---- 19. Dioclea

67′. Fertile stamens 8–10, the anthers alike.
69. Calycine bracts wanting; stipels wanting; pod less than 2 cm long; seeds 2; flowers yellow ---------- 38. Rhynchosia
69′. Calycine bracts present (sometimes caducous); stipels present; pod more than 2 cm long; seeds mostly more than 2; flowers red, pink, purple, blue, mostly not yellow.
70. Style pubescent.
71. Calyx tubular, more than 5 mm long; upper bracts connate; ovary stipitate ---------- 12. Clitoria
71′. Calyx campanulate, less than 5 mm long; bracts free; ovary subsessile.
72. Pod with style persistent 8–10 mm long; hilum ⅓–½ as long as the seed perimeter, covered with a prominent, white, spongy cushion; seeds 3–6, 9–12 mm long; style flattened ---------- 28. Lablab
72′. Pod without persistent style; hilum less than ⅓ as long as the seed perimeter, cushion wanting or inconspicuous; seeds 3–27, 3–25 mm long; style terete.
73. Pod compressed with transverse constrictions outside; hilum uncovered, the hilar groove visible; style pubescence continuous from top to bottom ---------- 35. Pachyrhizus
73′. Pod without transverse constrictions; hilum usually covered with white cushion remnants; pubescence of style discrete from that of the ovary.
74. Fruiting pedicels 4–31 mm long; bracts and bracteoles persisting into flowering stage; seeds 3–10, lens heart shaped; style coiled through 2 revolutions; pubescence including uncinate hairs ---------- 36. Phaseolus
74′. Fruiting pedicels 1–17 mm long; bracts and bracteoles caducous before flowering; seeds 6–27, the lens inconspicuous; style various, if coiled then through 3–5 revolutions; uncinate hairs wanting.
75. Wings much larger than the other petals; the keel fold transverse; upper calyx teeth free; inflorescence nodes not swollen ---------- 31. Macroptilium

75′. Wings about equalling the other petals, keel fold lateral or wanting; upper calyx teeth usually partly connate; inflorescence nodes conspicuously glandular swollen ---- 47. Vigna

70′. Style glabrous.
76. Inflorescence conspicuously nodose.
77. Seed with the hilum small, circular; calyx lobes 5; leaves rhombic.
78. Pods drying black; involucral bracts lanceolate, persistent through flowering ---- 37. Pueraria
78′. Pods drying green or brown; involucral bracts linear, caducous ---- 8. Calopogonium
77′. Seed with the hilum linear, short or encircling the seed; calyx lobes 4–5; leaves elliptical or ovate.
79. Seeds large, more than 8 mm long; pod septate, woody; flowers large ---- 19. Dioclea
79′. Seeds smaller, less than 6 mm long; pod with cellulose material around the seeds; flowers tiny, less than 1 cm long ---- 25. Galactia
76′. Inflorescences not nodose.
80. Calyx tubular, more than 5 mm long; style more than 1.5 mm long; anthers 10, uniform; corolla more than 1 cm long; bracts deciduous ---- 13. Cologania
80′. Calyx campanulate, less than 5 mm long; style very short; anthers 5 alternating with 5 staminodes; corolla less than 8 mm long; bracts mostly persistent ---- 44. Teramnus

1. ABRUS

W. G. D'Arcy[7]

Abrus L., Syst. Nat., ed. 12. 2: 472. 1767. TYPE: *A. precatorius* L.

Mostly twining *vines,* seldom shrubby. *Leaves* even pinnate; leaflets mostly numerous, mucronate; rachis grooved, mucronate; stipels minute; stipules persistent. *Inflorescences* axillary or lateral pseudoracemes, terminating leafy or leafless branches, with 1–several sessile flowers at a node; bracts and bracteoles often caducous. *Flowers* with the calyx campanulate, lobed or short toothed; standard apically notched and with a short claw, the wing petals shorter than the keel petals; stamens 9, monadelphous, the staminal tube adnate to the standard; style curved, glabrate. *Legume* oblong to linear, much compressed or not, the valves pubescent, often becoming indurated, septate, the short slender beak downturned; seeds ovoid, sometimes compressed, arillate, sometimes with an annulus around the hilum.

This genus resembles members of the Phaseoleae in its many leaflets which are borne equal pinnately. The 9 stamens with united filaments are distinctive, as is the lack of a terminal leaflet.

The genus is circumtropical and, according to circumscription, includes 4–24 species. Only 2 of these species occur in the New World.

Literature:

Breteler, F. J. 1960. Revision of *Abrus* Adanson (PAP.) with special reference to Africa. Blumea 10: 607–624.

Verdcourt, B. 1970. Studies in the Leguminosae-Papilionoideae for the 'Flora of Tropical East Africa': II. Kew Bull. 24: 235–307.

1. **Abrus precatorius** L., Syst. Nat., ed. 12. 2: 472. 1767. LECTOTYPE: Ceylon, *Hermann,* Fl. Zeylan. 284 (BM, not seen), fide Breteler 1960.—FIG. 1.

Slender *vine*; stems twining, pubescent with appressed white hairs, glabrescent. *Leaves* pinnate with 5–13 pairs of leaflets; leaflets oblong to ovate, mostly 9–15 mm long, 5–7 mm wide, apically rounded or truncate and mucronulate, sometimes acute, basally obtuse, rounded or truncate; petiolules 0.5–1 mm long; petioles shorter than the width of a leaflet; rachis mostly 7–10 cm long, sparingly pubescent with ascending hairs; stipels minute, following the rachis; stipules subulate, 1–2 mm long. *Inflorescences* leafless pseudoracemes; peduncles stouter than the petioles and often stouter than the stems, 6–10 cm long, bearing ca. 4 pairs of minute bracts along the length; rachis strongly angled, somewhat congested, 3–6 cm long, the flowers 1–15 per node, pedicels 1–2 mm long, glabrous except for the apical swelling. *Flowers* white or pinkish, ca. 1 cm long, calyx cupular, ca. 2 mm long with low teeth, sparingly short pubescent; standard obovate, 8–9 mm long, the wing petals upcurved, ca. 6 mm long, stamens not exserted. *Legume* oblong, somewhat oblique, ca. 2.5 cm long, 1.5 cm wide,

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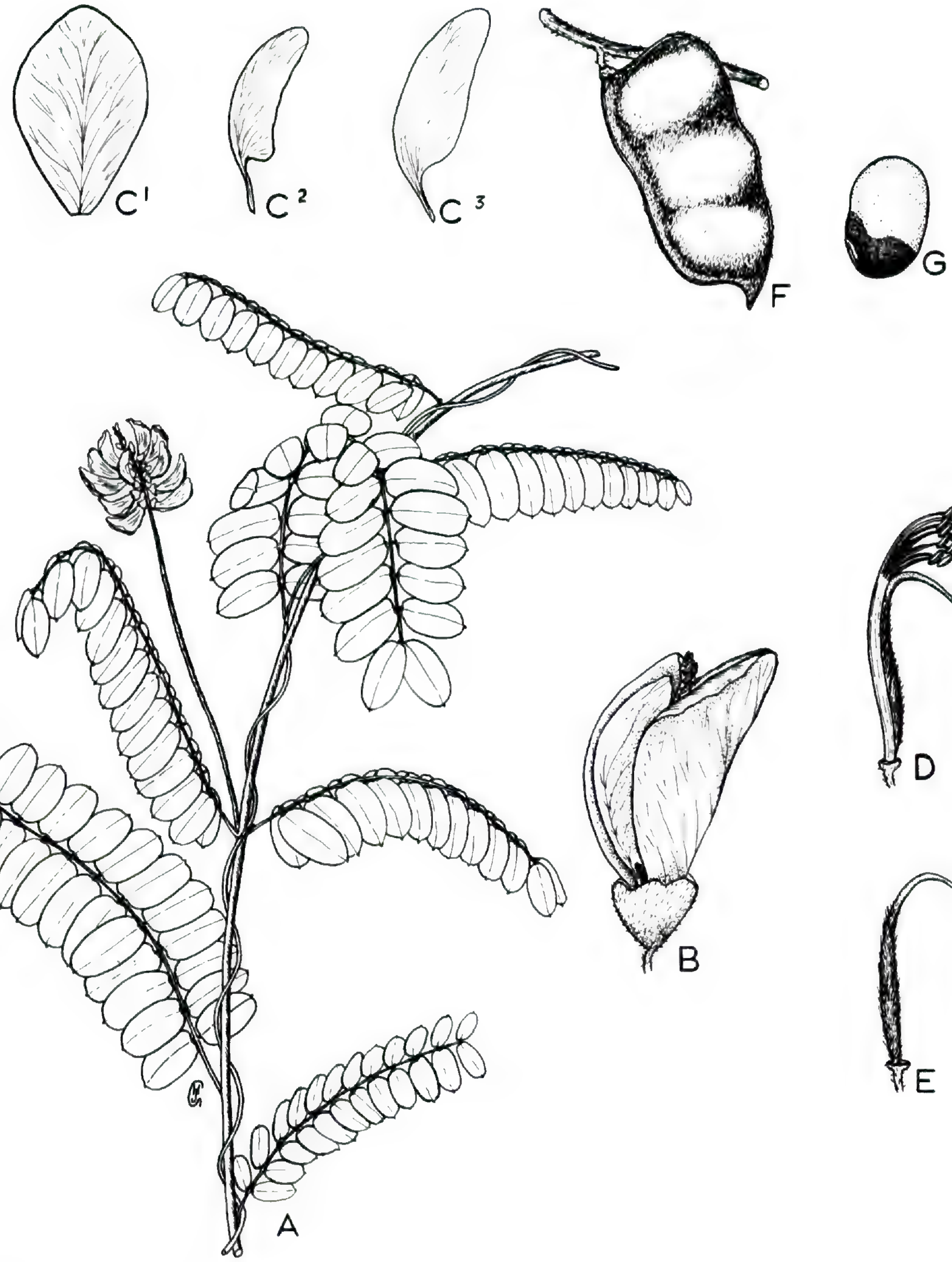

FIGURE 1. *Abrus precatorius* L.—A. Habit (×½). [After *Wedel 1731.*]—B. Flower (×3).—C. Corolla.—C^1. Standard (×2).—C^2. Wing petal (×2).—C^3. Keel petal (×2).—D. Stamens (×3).—E. Pistil (×3). [After *Wedel 1410.*]—F. Fruit (×1). [After *Gentle 1203*, Belize.]—G. Seed (×2). [After *Wedel 1308.*]

hardly stipitate, the beak slender, 3–5 cm long, downturned, dehiscent along 1 margin, the valves softly pubescent, compressed but bulging over the seeds; seeds 5–6, subglobose or slightly compressed ovoid, bright shiny scarlet with a black area near the hilum, ca. 6 mm long, the hilum depressed, ca. 1 mm long.

Abrus precatorius is usually immediately recognizable by its bright shiny red and black seeds. The vine bears leaves with many leaflets, and the congested pseudoracemes of small flowers is also distinctive, but these characteristics may lead to confusion with members of the Phaseoleae.

This species occurs in tropical and warm temperate countries on both hemispheres. In Panama it is apparently confined to the Caribbean coast.

The bright seeds of this species are much used for beads. They contain highly toxic compounds and a single seed may be lethal to a man if the hard seed coat is broken before ingestion. The toxic principle is also found in the roots although the roots are reportedly eaten as food in India. The English name is *Precatory Beads*, and in Spanish they are known as *Bejuco de Peronía* or *Bejuco de Peonía*. Nevertheless many common names have been applied to this plant.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 1304, 1308* (GH, MO). Water Valley, *Wedel 1371* (GH), *1410* (GH, MO). Isla Colón, *Wedel 2822* (GH). SAN BLAS: Mainland Point, *Duke 8981* (MO). Ailigandí, *Dwyer 6828* (MO). Mainland opposite Ailigandí, *Lewis et al. 77* (GH, MO). Playon Chico, *Stier 153* (MO).

2. ACOSMIUM

Michael O. Dillon[8]

Acosmium Schott in Spreng., L. Syst. Veg., ed. 16, 4: 406. 1827. TYPE: *Acosmium lentiscifolium* Schott.

Leptolobium Vog., Linnaea 11: 388. Apr.–Jun. 1837, non Bentham, Jun. 1837; 1838. LECTOTYPE: *Leptolobium dasycarpum* Vog. = *Acosmium dasycarpum* (Vog.) Yakovl.

Thalesia Mart. ex Pfeiffer, Nom. Bot. 2(2): 1384. 1874, nomen nudum based on *Leptolobium* Vog., non Raf. 1818, nomen nudum.

Trees or *shrubs*, to 40 m, unarmed. *Leaves* alternate, imparipinnate; leaflets alternate to subopposite, (3–)5–21, lanceolate to ovate, apically retuse or emarginate, basally obtuse to truncate, subcoriaceous or membranaceous; stipules small, caducous or inconspicuous; stipels minute or absent. *Inflorescence* of racemes or panicles, terminal, rarely completely axillary; bracts and bracteoles narrow, small, often caducous. *Flowers* small, sessile or pedicellate, calyx turbinate-campanulate, lobes usually 5, unequal, valvate or rarely narrowly imbricate, corolla yellowish white, petals 5, all similar, free, erect patent; stamens 10(5), free, subequal, exserted; filaments inflexed; anthers uniform, ellipsoid, dorsifixed; ovary sessile or short stipitate, 1–4-ovuled; style filiform; stigma small or truncate, terminal. *Fruit* oblong to broadly linear, plano-compressed or rarely turgid, indehiscent, coriaceous or woody, narrowly winged, reticulate; seeds ovate or orbicular, compressed, brown to reddish brown, the hilum apical, elliptic. Chromosomes: $n = 9$.

Acosmium sensu Yakovlev (1969) is composed of some 17 species, primarily distributed in tropical and subtropical regions of the Western Hemisphere. Its center of diversity is in Brazil, with only *Acosmium panamense* extending north into Central America to southern Mexico. While most species are rare and of

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FIGURE 2. *Acosmium panamense* (Benth.) Yakovl.—A. Habit (×½).

little economic importance, several of the more widespread species are valuable timber trees used in general construction and the manufacture of charcoal.

Literature:

Mohlenbrock, R. H. 1963. A revision of the leguminous genus *Sweetia*. Webbia 17(2): 223–263.

Rudd, V. E. 1968. Leguminosae of Mexico—Faboideae (I. Sophoreae and Podalyrieae). Rhodora 70: 492–532.

Yakovlev, G. P. 1969. A review of *Sweetia* and *Acosmium*. Notes Roy. Bot. Gard., Edinburgh 29: 347–355.

1. **Acosmium panamense** (Benth.) Yakovl., Notes Roy. Bot. Gard., Edinburgh 29: 353. 1969.—FIG. 2.

Sweetia panamensis Benth., J. Linn. Soc., Bot. 8: 263. 1865. TYPE: Panama, Canal Zone, Paraíso Station, Panama Railroad, *S. Hayes 267* (K, not seen; photo, NY 2807).
Dalbergia lavigata Standley, Trop. Woods 12: 5. 1927. TYPE: Belize, lower Belize River, *Record* (US, not seen).

Trees, to 12 m, the crown rounded. *Leaves* alternate, imparipinnate; rachis slender, canaliculate, puberulent, 6–12 cm long; leaflets 7–13, subopposite, 3–8 cm long, 2–3 cm wide, ovate to elliptic, apically obtuse, usually retuse, basally obtuse to broadly cuneate, coriaceous, nitid above, glabrous, pale beneath, glabrous, reticulate; petiolules ca. 3 mm long, terete, rugose; stipules linear, caducous. *Inflorescence* paniculate, branched, axillary to terminal leaves, puberulent, primary rachis 8–14 cm long, secondary 2–5 cm long; bracts and bracteoles linear, 1–3 mm long, caducous. *Flowers* numerous, ca. 6 mm long, pedicellate, pedicels ca. 3 mm long, puberulent; calyx turbinate-campanulate, persistent, 3–4 mm long, puberulent, 5-lobed, teeth ca. 2 mm long, acute, subvalvate; petals 5, free, white or cream colored, subequal, ca. 4 mm long, 2–3 mm wide, spatulate, emarginate, clawed; stamens 10, filaments equal to petals; anthers ca. 1 mm long, ovoid, dorsifixed, longitudinally dehiscent; ovary glabrous, stipitate, the stigma minutely capitate-penicillate, 2–3-ovulate. *Fruit* oblong or elliptic, 5–9 cm long, (1.5–)2.0–2.5 cm wide, coriaceous, compressed, ca. 5 mm thick at the seeds, reticulate, the ends acute to obtuse, mucronate; seeds 1–3, lustrous, reddish brown, subovate, ca. 8 mm long, 6 mm wide, 2–3 mm thick, the hilum ca. 1 mm long.

Acosmium panamense is widespread from southern Mexico to northern Colombia and northwestern Venezuela, usually found in moist forests up to 800 m. This species is a valuable timber tree for its wood is strong, durable, and suitable for heavy construction such as bridges, wagons, and woodworking. Its bark is said to be used as an antimalarial in El Salvador. There are many local names (cf. Rudd, 1968) for this species, known as "malvecino" in Panama.

CANAL ZONE: Ancón Hill, 20 m, *Holdridge 6535* (MO). Red Devil drop zone, Howard Air Force Base, *Tyson 1871* (MO). DARIÉN: Río Congo, *Holdridge 6296* (SCZ). Patiño, *Pittier 6609* (GH, US) (leaves only). PANAMÁ: Taboga Island, *McDaniel & Cooke 12701* (FSU, MO). Agricultural Experiment Station, Matías Hernández, *Pittier 6793* (F, GH, MO, NY).

3. AESCHYNOMENE

Michael O. Dillon[9]

Aeschynomene L., Sp. Pl. 713. 1753. TYPE: *A. aspera* L.

Gajati Rumph. ex Adans., Fam. Pl. 2: 328. 1763. TYPE: *A. aspera* L.
Macromiscus Turcz., Bull. Soc. Nat. Mosc. 19(2): 507. 1846. TYPE: *M. brasiliensis* Turcz. = *A. montevidensis* Vog.
Ctenodon Baill., Adansonia 9: 236. 1870. TYPE: *C. weddellianum* = *A. oroboides* Benth.
Climacorachis Hemsley & Rose, Contr. U.S. Natl. Herb. 8: 43. 1903. TYPE: *C. mexicana* Hemsley & Rose = *A. villosa* Poir.
Secula Small, Fl. Miami 90, 200. 1913. TYPE: *A. viscidula* Michx. = *A. oroboides* Benth.

Herbs, shrubs, or small *trees*; stems terete, finely striate, unarmed. *Leaves*

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alternate, subimparipinnate, 1–10 cm long; leaflets 5–80, alternate or subopposite, subsessile, 2–40 mm long, 1–20 mm wide, glabrous to sericeous, often minutely glandular-punctate, 1–several costate; petioles 2–40 mm long; stipules peltate, appendiculate below the point of attachment or attached at the base and not appendiculate, membranous or foliaceous, persistent or caducous. *Inflorescences* racemose, paniculate, fasciculate, or rarely solitary, axillary or terminal, bracteate, bractlets paired and subtending calyxes, pedicels glabrous to pubescent, usually glandular. *Flowers* 5–15 mm long; calyx bilabiate to campanulate, commonly persistent; corolla yellowish to red or purple, petals usually clawed; stamens 10, essentially diadelphous, 5:5, filaments united into a sheath, open on carinal side, and with splitting on vexillar side delayed or merely incipient; anthers dorsifixed, or occasionally basifixed; pollen ellipsoidal, tricolpate; ovary 2–18 ovulate, rarely 1-ovulate, sessile or short stipitate; style incurved, not bearded; stigma terminal. *Fruit* a loment, (1–)2–18-articulate, subsessile to long stipitate, laterally compressed, occasionally torulose; seeds reniform, smooth, sublustrous, light brown to black, hilum circular, embryo axile, slightly bent, endosperm present, cotyledons fleshy. Chromosomes: $n = 10$.

The genus *Aeschynomene* is composed of about 350 species distributed throughout the warmer parts of the world. In the Western Hemisphere, its presumed center of origin, some 70 species range from the mid-Atlantic states in the United States, west to Baja California, Mexico, throughout Central America, the Antilles and south to the Rio La Plata, Argentina. Two American sections, *Aeschynomene* and *Ochopodium*, are recognized by Rudd (1955), both with representative species in Panama.

Most taxa appear to be of little economic importance; however, the pith from certain South American species is used for corks and for stropping knives and razors. Various Panamanian species are commonly referred to as "pega-pega."

Literature:

Rudd, V. E. 1955. The American species of *Aeschynomene*. Contr. U.S. Natl. Herb. 32(1): 1–172.

a. Stipules peltate, appendiculate below the point of attachment; calyx bilabiate, the upper lip 2-merous, the lower lip 3-merous (section *Aeschynomene*).
  b. Leaflets with 2–several costae.
    c. Ovary glabrous to puberulent; fruit glabrous to puberulent and occasionally with scattered tuberculate based trichomes, less than 0.8 mm in length, sutures between articulations well defined, usually more than 5-articulate ---- 1. *A. americana*
    cc. Ovary villous; fruit hispid with tuberculate based trichomes, 0.8–1.4 mm long, sutures not defined between articles, 5-articulate or less ---------- 9. *A. villosa*
  bb. Leaflets with 1 central costa.
    d. Fruit blackening on drying; calyx lips entire to subentire.
      e. Stipe and basal article separated by a suture; fruits submoniliform with both margins crenate ---------- 6a. *A pratensis* var. *caribaea*
      ee. Stipe and basal article continuous, not separated by a suture; fruits with one margin entire, the other entire or crenate ---------- 8. *A. sensitiva*
    dd. Fruit and vegetative parts turning brown or straw colored on drying, or remaining green; calyx lips definitely indented.
      f. Leaflets usually denticulate or serrulate-ciliate, 10–20 mm long, 4–8 mm wide; plant generally hispid; fruit 5–7 mm wide, hispid at maturity, not muricate, both margins entire or nearly so ---------- 3. *A. ciliata*

ff. Leaflets entire, 5–7(–10) mm long, 1–2(–2.5) mm wide; plant generally glabrous or sparsely hispid; fruit 4–5 mm broad, glabrous at maturity or with scattered trichomes 0.5 mm long, muricate, upper margin straight and lower margin crenate ..... 7. *A. rudis*

aa. Stipules not produced below the point of attachment to stem; calyx campanulate with 5 subequal lobes; articles 2–3 mm in diameter (section *Ochopodium*).

g. Fruit 2- or 3-articulate, the stipe 1–5 mm long.

h. Fruit usually biarticulate; leaves and stems canescent ..... 5. *A. histrix* var. *incana*

hh. Fruit 3-articulate; leaves pilose, stems hispid ..... 2. *A. brasiliana*

gg. Fruit 4- to 9-articulate, stipe 8–15 mm long ..... 4. *A. elegans*

1. **Aeschynomene americana** L.,[10] Sp. Pl. 713. 1753. TYPE: Jamaica, *Sloane* (BM, not seen).

Herbs to 2 m tall; stems erect to ascending, subglabrous to hispid. *Leaves* 2–7 cm long, 20–60 foliolate; leaflets linear-oblong, 4–15 mm long, 1–2 mm wide, subfalcate, 2–several costate, apices and margins usually serrate-ciliate; stipules appendiculate below the point of attachment, striate, glabrous to hispid, attenuate at each end. *Inflorescence* few flowered, axes flexuous, hispidulous; bracts cordate, acuminate, 2–4 mm long, 2–3 mm wide, glabrous, margins ciliate; bracteoles linear to linear-ovate, 2–4 mm long, 1.0–1.5 mm wide, acute to acuminate, glabrous, margins serrate-ciliate. *Flowers* yellow, (5–)6–8(–10) mm long, calyx 3–6 mm long, glabrous to sparsely hispid; petals 5–10 mm long, clawed, the standard suborbiculate to broadly obcordate, 5–10 mm wide, apices ciliate, wings obliquely oblong, 5–8 mm long, 2 mm wide, ciliate at the apex, keel blades 4–5 mm long, 2.5–3.5 mm wide; stamens 6–8 mm long. *Fruit* (3–)6–8(–9) articulate, articles 2.5–5.0 mm wide, 3–6 mm long, glabrous to puberulent, sometimes with glandular trichomes, verrucose at maturity, the margins thickened; seeds 2–3 mm long, 1.5–2.0 mm wide, dark brown.

Aeschynomene americana is the most widespread and abundant member of the genus in Panama, occurring in nearly every province. It is distinguished from its closest relative, *A. villosa,* in possessing loments with generally more than 4 articulations, and with these possessing well-defined lateral sutures.

Rudd (1955) recognized 2 varieties from Panamanian material based upon differences in fruit pubescence. Since no clear ecological or geographical pattern is apparent, this species is treated as being polymorphic for fruit pubescence with vegetative and floral characters remaining quite constant.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 343* (US). Water Valley, *Wedel 1531* (GH, MO, US), *1616* (GH, MO). Isla Colón, *Wedel 2973* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 12817, 12835* (both MO), *13154* (DUKE, MO, NY, SCZ). Venado Beach, *Correa & Gonzales 523* (DUKE, MO, PMA). Summit Garden, *Croat 12830* (MO, NY, SCZ). Río Indio, *Dodge & Allen 17378* (GH). Ft. Sherman site, *Dwyer 8594* (MO). Pipeline Road, 5–6 mi N of Gamboa, *Gentry 6676* (MO). Between Summit and Gamboa, *Greenman & Greenman 5260* (MO). Las Cruces Trail, *Hunter & Allen 737* (GH, MO). 0.5 mi N of Gamboa, *Lazor & Tyson 5685* (MO). Near Rio Petitpie on road to Ft. Sherman, *Mori & Kallunki 3669* (MO). 6 km E of Gamboa, *Nee 9005* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Nowicke et al. 3597* (DUKE, MO). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5190* (US). Río Grande, near Culebra, *Pittier 2112* (NY, US). Balboa, *Standley 25518, 25540* (both US). Las Cascadas Plantation, near

[10] For a list of synonyms see Rudd (1955). Only the listed names have been used for Panamanian material.

Summit, *Standley 25768, 25776* (both US). Summit, *Standley 26921* (US). Near Gatún, *Standley 27268* (US). Frijoles, *Standley 27643* (US). Gamboa, *Standley 28325* (US). Near Fort Randolph, *Standley 28735* (US). Mount Hope Cemetery, *Standley 28847* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29059, 29182* (both US). Río Pedro Miguel near East Paraíso, *Standley 30046* (US). Darién Station, *Standley 31560* (SU). Obispo, *Standley 31780* (US). 6 mi N of Gamboa, *Tyson 3500* (MO). Albrook Air Force Base, *Tyson & Lazor 6012* (FSU). 1 mi N of Summit, *Tyson et al. 2752* (MO, PMA). Cutover secondary forest, margin of the Pipeline road N to Gamboa, *Wilbur & Teeri 11245* (DUKE, GH, MO). Playa Venado, *Wilbur & Teeri 12959* (DUKE). Pipeline road, NW of Gamboa, *Wilbur & Teeri 13378* (DUKE). CHIRIQUÍ: 2 mi W of Concepción, *Baltimer* (MO). Near Veladero, *Burt & Koster 128* (MO). Rabo de Puerco, 8 mi W of Puerto Armuelles, *Liesner 33* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, *Liesner 491* (MO). Boquete, *Lewis et al. 391* (GH, MO, US). 2 mi S of Puerto Armuelles, *Wilbur et al. 13579* (DUKE). COCLÉ: El Valle, *Baltimer 1470* (MO). Olá, *Pittier 5092* (NY, US). Río Grande, *Troetsch 24* (DUKE, PMA). 10 mi E of Natá, *Tyson 5237* (FSU, SCZ). Penonomé, *Williams 359* (NY, US). COLÓN: Calzada Larga, *Gracia 48* (PMA). Quebrada Bonita, 3 km NW of Salamanca, 13 km E of Buenos Aires, *Nee 9107* (MO). 1.2 mi NE of bridge over Río Piedras on road from Portobelo to Pilón, *Nee & Mori 3669* (MO, PMA). Without definite locality, *Rose 23997* (GH, NY, US). DARIÉN: Santa Fé, *Duke 9481* (NY, US). HERRERA: Chitré, *Allen 1104* (GH, MO, US). Ocú, *Allen 4087* (MO). 4 mi S of Los Pozos, *Tyson 2679, 2695* (both FSU, MO). 10 mi S of Ocú, *Tyson 2822* (MO, US). LOS SANTOS: Punta Mala, *Tyson 2722* (SCZ). PANAMÁ: Isla Taboga, *Allen 1283, 1295* (both GH, MO, US). 1 mi E of Tocumen, *Blum & Tyson 1953* (FSU, MO, SCZ). Campo Experimental de Monte Oscuro, *Correa 1914* (PMA). Between Capira and Potrero, *Dodge & Hunter 8604* (GH, MO). Río Indio, *Dodge & Allen 17378* (MO). Tocumen Airport, *Dwyer 5603* (PMA). Chilibre, *Dwyer 11978* (MO). Urivé, *Fernandez 131* (MO, PMA). Without other Locality, *Hayes 455, 767* (both NY). El Palorin, *Heriberto 255* (NY, US). San Jose Island, *Johnston 832, 1201* (both GH, US). Icaco Island, *Johnston 937* (GH, MO, US). Alhajuela, *Killip 3226* (US). SE slope of Cerro Campana, *Lewis et al. 3153* (MO). Cerro Campana, *McDaniel 8121* (DUKE, FSU, MO). Cerro Penon, 3 km S of Alcalde Diaz, *Nee 8894* (MO). Matías Hernández, *Pittier 6871* (NY, US). Between Río Pacora and Chepo, *Porter et al. 5144* (MO). Old Panama, *Porterfield 1933* (NY). Vista del Mar, *Porterfield* (NY). Arraijan, *Porterfield* (NY). Las Cumbres, *Puga 42* (MO). 1 mi W of Bejuco, *Tyson & Blum 2543* (FSU, MO, SCZ). Bella Vista, *Standley 25405* (US). E of Río Tocumen, *Standley 26579, 29477* (both US). Corozal Road near Panama, *Standley 26787, 26865* (both US). Toboga Island, *Standley 27110* (US). Río Tapia, *Standley 28066* (US). 2 km entrada camino Cerro Azul, *Taylor 5, 78* (both PMA). VERAGUAS: 2 km NW of Atalaya, *Nee 8251* (MO). 1 mi W of Santiago, *Tyson 5171* (FSU, SCZ). Puerto Mutis 12 mi S of Santiago, *Tyson 6001* (DUKE, FSU, MO).

2. **Aeschynomene brasiliana** (Poir.) DC., Prodr. 2: 322. 1825. TYPE: Brazil, Rio de Janeiro, *Commerson* (P, holotype, not seen; F, fragment).

Prostrate or decumbent *herb*, stems to ca. 1 m long, glandular-hispidulous, crisp-pubescent. *Leaves* mostly 8–12 foliolate, less than 3 cm long; leaflets usually obovate, obtuse to rounded at each end, ciliate, mucronulate, sparsely pubescent, ca. 7 mm long, ca. 4 mm wide; stipules ovate, acuminate, 3–4 mm long, ca. 1-mm wide, glandular-hispidulous, ciliolate. *Inflorescence* racemose, axillary, 3–8 flowered; peduncles and pedicels hispid; bracts and bracteoles ovate, 1.0–2.5 mm long, 1.0–1.5 mm wide, hispidulous, ciliate. *Flowers* yellow, 5–8 mm long; calyx 1.5–3.0 mm long, ciliate, hispidulous; standard ca. 6 mm long, the claw ca. 1 mm long, the blade suborbiculate, ca. 5 mm in diameter, pubescent on the outer face, retuse, wings and keel equal to the standard, ca. 2 mm wide; stamens ca. 6 mm long. *Fruit* 2–3 articulate, the stipe 3–4 mm long, hispidulous with trichomes ca. 0.5 mm long, the articles 2–3 mm in diameter, moderately crisp-pubescent; seeds ca. 2 mm long, ca. 1.5 mm wide, dark brown. Chromosomes: $n = 10$.

This species is widespread throughout tropical America, but is represented in Panama by only a few collections. This species is distinguished from the superficially similar *Aeschynomene histrix* var. *incana* by the former's more prostrate

habit, glandular-hispidulous stems, and fruits with longer stipes. It is known locally as "pega-pega."

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5189* (F, US). Ancón Hill, *Standley 25153* (MO, US). Sosa Hill, Balboa, *Standley 25275* (US). Balboa, *Standley 25586* (US). Cerro Gordo, near Culebra, *Standley 26042* (US). Sosa Hill, Balboa, *Standley 26442* (US). Corozal, *Standley 27369* (US). Along old Las Cruces Trail, between Ft. Clayton and Corozal, *Standley 29111* (US). Balboa, *Standley 29295* (US). Summit, *Standley 30069* (US). PANAMÁ: Bald Hill, San Jose Island, *Johnston 880* (GH). Agricultural Experiment Station of Matías Hernández, *Pittier 6908* (US). Corozal Road near Panamá, *Standley 26806* (US). Juan Franco race track near Panamá, *Standley 27724* (US). Taboga Island, *Standley 28022* (US). Tumba Muerto Road near Panamá, *Standley 29747* (US). Between Las Sabanas and Matías Hernández, *Standley 31866* (US). Between Matías Hernández and Juan Díaz, *Standley 32083* (US). Río Mar, *Tyson et al. 2296* (FSU, PMA).

3. **Aeschynomene ciliata** Vog., Linnaea 12: 84. 1838. SYNTYPES: Brazil, Para: Belem, *Sieber 13736* (B, presumably destroyed; photo US, not seen). Brazil, between Rio de Janeiro and Cabo Frio, *Sello* (not located, possibly B or BM).

A. hispida sensu Standley, Flora of Panama Canal Zone, Contr. U.S. Natl. Herb. 27: 210. 1928.

Herb 1.0–2.5 m tall; stems hispid with yellow glandular trichomes. *Leaves* 10–15 cm long, 30–40 foliolate, petiole and rachis hispid; leaflets oblong with rounded to retuse apices, cordate and slightly asymmetrical basally, 10–15(–30) mm long, 3–5(–8) mm wide, glabrous, costae central, serrulate-ciliate, micropunctate adaxially; stipules appendiculate below the point of attachment, upper portion acute, lower rounded, 1–2 cm long, serrulate-ciliate, caducous. *Inflorescence* racemose, axillary, 5–many flowered; peduncles and pedicels hispid; bracts ovate-subcordate, 4–6 mm long, 2–3 mm wide; bracteoles lanceolate-ovate, acute, ciliate, 3–4 mm long, 1–2 mm wide. *Flowers* yellow, 8–10 mm long; calyx bilabiate, the upper lip trifid, the lower lip bifid, 5–7 mm long; the standard orbiculate, 5–8 mm in diameter, the claw ca. 2 mm long, serrulate-ciliate, emarginate, wings ca. 8 mm long, the claw 3 mm long, the blade ca. 5 mm long, 4 mm wide, ciliate, keel petals entire, the claws ca. 1.5 mm long, the blades 5–8 mm long, ca. 3 mm wide; stamens ca. 8 mm long. *Fruit* usually 8–10 articulate, stipe 5–10 mm long, hispid, the margins entire, articles ca. 4 mm long, 6 mm wide; seeds 3–4 mm long, ca. 2 mm wide, dark brown.

This species is distributed from southern Mexico to Ecuador, Amazonian Brazil, and Jamaica. In Panama it is known from tropical moist forest in the Canal Zone and the immediate vicinity, usually growing near water. It appears to flower and fruit principally from November to January.

CANAL ZONE: Barro Colorado Island, *Bailey & Bailey 763* (F). Mindi, *Cowell 173* (NY). Chagres, *Fendler 99* (MO, US). Barro Colorado Island, *Foster 1403* (MO, PMA, US). Without exact locality, *Hayes 184*? (NY). Between France Field and Cativa1, *Standley 30270* (US). CHIRIQUÍ: Quebrada del Medio, 2 km N of Punta de Burica, *Busey 753* (MO). COLÓN: Portobelo, *D'Arcy & D'Arcy 6691* (MO). PANAMÁ: Tocumen Airport, *Dwyer 5194* (MO, PMA). Matías Hernández, *Pittier 6946* (GH, NY, US). Juan Díaz, *Standley 30516* (US). Capitana, *Taylor 28* (PMA).

4. **Aeschynomene elegans** Schlecht. & Cham., Linnaea 5: 583. 1830. TYPE: Vera Cruz, Hacienda de la Laguna, Jalapa, Mexico, *Schiede & Deppe* (F, GH).

Herb, stems to 0.5 m, hispid with tuberculate-based, glandular trichomes, to 1 mm long, sericeous with weak, appressed trichomes, to 0.25 mm long. *Leaves*

8–12 foliolate, ca. 2 cm long; leaflets usually obovate, obtuse to truncate, mucronulate, oblique, upper surface glabrous, reticulate beneath, costae villous with appressed trichomes, ciliolate, ca. 5 mm long, ca. 2.5 mm wide; petiole hispid; rachises villous. *Inflorescence* racemose, axillary, 2–6 flowered, longer than the subtending leaves, pedicels and peduncles with indument like the stems; bracts and bracteoles ovate, acute, ca. 1 mm long, less than 1 mm wide, ciliate. *Flowers* yellow, ca. 5 mm long; calyx ca. 1 mm long, ciliolate, hispidulous; standard ca. 4 mm long, the claw ca. 1 mm long, the blade elliptic-orbiculate, entire, wings and keel equal to standard, 1.5–2.0 mm wide; stamens 4–5 mm long. *Fruit* moniliform, curved or straight, (3–)4–6 articulate, the stipe 7–10 mm long, hispid, the articles ca. 2.5 mm long, ca. 2 mm wide, crisp-pubescent, often slightly glabrate; seeds ca. 2 mm long, ca. 1 mm wide, dark brown. Chromosomes: $n = 10$.

This taxon is widespread in tropical America, but apparently rare in Panama, only being known from El Boquete, Chiriquí at ca. 1,500 m. It is called "dormidea" in Panama, and "pega-pega" in Costa Rica and Colombia.

CHIRIQUÍ: El Boquete, *Maurice 726* (US). Alta Boquete, *Terry 1263* (F, GH, MO, US).

5. **Aeschynomene histrix** Poir., Lam. Encycl. Méth. Bot. Supp. 4: 77. 1816.

5a. **A. histrix** var. **incana** (Vog.) Benth., in Mart. Fl. Bras. 15(1): 69. 1859.

Aeschynomene incana Vog., Linnaea 12: 90. 1838; non G. F. W. Mey. ex DC., 1825. TYPE: Brazil, *Sellow* (F, fragment).

Much branched *herb*, stems to 0.5 m, prostrate to suberect, canescent. *Leaves* 8–18-foliolate, to 3 cm long; leaflets oblong-elliptic, rarely obovate, obtuse to rounded, apiculate, entire, ciliate, oblique basally, pubescent, 4–8 mm long, 1.5–4.0 mm wide; stipules lanceolate, acuminate 4–10 mm long, 1–3 mm wide, hispid, serrulate-ciliate. *Inflorescence* racemose, axillary, 4–15 flowered; peduncles and pedicels hispid; bracts and bracteoles ovate, acute, 1–2 mm long, 1 mm or less wide, hispid, ciliate. *Flowers* 6–7 mm long; calyx 2–3 mm long; standard ca. 5 mm long, the claw ca. 1 mm long, blade suborbiculate, 4–6 mm in diameter, the wings and keel about as long as the standard, 1–2 mm wide; stamens 4–5 mm long. *Fruit* 2-articulate, the stipe 1–2 mm long, hispid with trichomes 2–4 mm long, mostly at the basal article, the articles 2.0–2.5 mm in diameter, glabrous to puberulent; seeds 1.5–2.0 mm long, 1.0–1.5 mm wide, black.

Aeschynomene histrix var. *incana* is readily distinguished from the typical form by its more robust habit and larger leaf size. Fruit and flower characteristics are essentially the same for the 2 varieties and there appears to be intergradation; therefore, only varietal status seems justified. Variety *incana* is found from Mexico to South America, whereas variety *histrix* is primarily South American in distribution. In Panama it is found in wet sites below 100 m in the provinces bordering the Gulf of Panama from Los Santos to Panama.

CANAL ZONE: Ancón Hill, *Greenman 5127* (MO). S side of Summit Gardens, *Nee 9549* (MO). COCLÉ: Río Hato airstrip, *Burch et al. 1150* (GH, MO, US). Aguadulce, *Pittier 4863* (GH, NY, US). Penonomé, *Williams 102* (NY, US). LOS SANTOS: Chitre/Las Tablas, *Burt & Rattray 55A* (MO). PANAMÁ: San Carlos, Río Hato, *Burt & Rattray 46* (MO). Hills NE of Hacienda La Joya, *Dodge et al. 16887* (MO). Savannas near Chepo, *Duke 6040* (MO). Without exact locality, *Seemann 216?* (NY).

6. **Aeschynomene pratensis** Small, Bull. New York Bot. Gard. 3: 423. 1905.—FIG. 3F.

6a. **Aeschynomene pratensis** var. **caribaea** Rudd, Contr. U.S. Natl. Herb. 32: 47. 1955. TYPE: Cuba, Isla de Pinos, near Nueva Gerona, *Curtiss 300* (F, GH, isotypes).

Herbs; stems 1–2 m long, becoming suffruticose, drying dark, glabrous or sparsely hispid. *Leaves* 4–7 cm long, commonly 20–25 foliolate; leaflets oblong, obtuse to subacute, obliquely rounded basally, 5–10 mm long, 1.5–2.5 mm wide, micropunctate adaxially, the costae central, petioles and rachises glabrous or with few glandular trichomes; stipules entire, acuminate above, truncate below, erose peltate, appendiculate below the point of attachment, caducous. *Inflorescence* racemose, few flowered, axillary; peduncles and pedicels glabrous to hispid; bracts stipuliform, 4–5 mm long, 1–2 mm wide, margin entire, hyaline, sometimes ciliate; bracteoles ovate, subacute, 3–4 mm long, 1.5–2.0 mm wide, hyaline margined. *Flowers* yellow, 7–10 mm long; calyx bilabiate, 4–5 mm long, vexillary lip subentire to 2-denticulate, carinal lip 3-denticulate; standard suborbiculate, 7–10 mm long, 5–9 mm wide, the claw 2–3 mm long, wings 6–10 mm long, 3–4 mm wide, the claw 1 mm long, keel falcate, 6–9 mm long, ca. 3 mm wide, the claws ca. 1 mm long; stamens 7–10 mm long. *Fruit* 5–9 articulate, stipe 8–10 mm long, glabrous, articles 5–6 mm long, 4–5 mm wide, glabrous, reticulate veined, verrucose at maturity, basal article separated from stipe by a suture, both margins crenate, or dorsally subentire; seeds 4–5 mm long, 2.5–3.0 mm wide, dark brown.

This variety is found chiefly in the Caribbean area and southward to central South America, and it has been introduced into the Old World. In Panama it has been collected from wet areas from the provinces around the Gulf of Panama. Variety *caribaea* is distinguished from variety *pratensis* by the former's smaller flowers and fruits, and also by the latter's restricted distribution in the everglades of Florida. *Aeschynomene pratensis* is distinguished from *A. sensitiva* var. *sensitiva*, its closest relative, by its slightly larger flowers and the presence of a suture between the stipe and the first article.

COCLÉ: Penonomé, *Ebinger 1016* (MO, SCZ, US); *Williams 130* (NY). Between Las Margaritas and El Valle, *Woodson et al. 1768* (A, MO, NY). HERRERA: Ocú, *Ebinger 1049* (MO, US). PANAMÁ: Road between Panama and Chepo, *Dodge et al.* (GH, MO). Without exact locality, *Seemann 203?* (GH). Nuevo San Francisco, *Standley 30753* (MO).

7. **Aeschynomene rudis** Benth., Pl. Hartw. 116. 1843. TYPE: Ecuador, Guayas, Guayaquil, *Hartweg 649* (K, not seen).

Shrubby *herb*, 1–2 m tall, sparsely hispid. *Leaves* 4–10 cm long, 30–40 foliolate, petiole and rachis hispidulous; leaflets oblong, rounded to truncate; slightly asymmetrical basally, 8–10 mm long, 2–3 mm wide, glabrous, the costae central, entire, micropunctate adaxially; stipules 7–15 mm long, 2–3 mm wide, the upper portion acute, the lower 2–3 mm long, rounded, entire. *Inflorescence* racemose, few flowered, axillary; peduncles and pedicels hispidulous; bracts subovate, acute, 3–4 mm long, 1.5–2.0 mm wide, ciliate; bracteoles ovate-oblong, acute, 2–3 mm long, ca. 1 mm wide, ciliate. *Flowers* yellow, (8–)10–15 mm long;

calyx 5–8 mm long; the standard ca. 14 mm long, the claw 2 mm long, the blade orbiculate, ca. 12 mm in diameter, retuse; the wings ca. 10 mm long, the claw ca. 1 mm long, the blade ca. 9 mm long, 5–6 mm wide; the keel petals ca. 10 mm long, 3 mm wide; stamens ca. 12 mm long. *Fruit* 6–10 articulate, the upper edge essentially entire, the lower edge crenate to subentire, the stipe glabrous, 3–6 mm long, the articles 4–6 mm in diameter, moderately hispid, usually muricate or verrucose at the center; seeds ca. 3 mm long, 2 mm wide, black.

Aeschynomene rudis is principally found in moist or wet places in tropical and warm temperate America, ranging from the United States to Argentina. It is apparently rare in Panama, with no collections known from the last 25 years. It might be confused with *A. ciliata* from which it is distinguished by several characters as indicated in the key to species.

PANAMÁ: NE of Hacienda la Joya, *Dodge et al. 16913* (MO).

8. **Aeschynomene sensitiva** Swartz,[11] Prodr. Veg. Ind. Occ. 107. 1788. TYPE: based upon Plumier's *pl. 149, fig. 2,* Icones 1693 (MO).—FIG. 3A–E.

Herbs to 4 m tall; stems glabrous to glabrate below, fruiting branches glabrous to moderately hispidulous with glandular trichomes. *Leaves* 2–10 cm long, 10–40 foliolate, petiole and rachis hispidulous; leaflets oblong, obtuse to truncate, 4–15 mm long, 1.5–3.0 mm wide, the costae central, the nerves inconspicuous, minutely punctate adaxially; stipules appendiculate below the point of attachment, caducous, 5–20 mm long, 1.5–5.0 mm wide, subentire, acute to acuminate above, truncate below, erose. *Inflorescence* racemose, axillary, 4–8 flowered; peduncles and pedicels subglabrous to densely hispidulous; bracts stipuliform, entire to ciliate-laciniate; bracteoles ovate, subacute, 1.5–5.0 mm long, 1–2 mm wide, entire to ciliate. *Flowers* yellow, 5–6 mm long; calyx 2–4 mm long, usually ciliate, vexillar lobe emarginate or subdenticulate, the cardinal lobe obscurely 3-dentate, standard 6–8 mm long, the claw 1.5–2.0 mm long, the blade suborbiculate, 4.5–6.0 mm wide, ciliate, sometimes retuse, wings and keel subequal to the standard, the claws 0.5–1.0 mm long, blades 3.5–7.0 mm long, 2.5–3.5 mm wide; stamens 5–7 mm long. *Fruit* a loment, 5–8 (rarely –10) articulate, stipe 4–8 mm long, glabrous, articles 5–7 mm long, 4–7 mm wide, glabrous to sparsely hispid, smooth to verrucose, the upper margin of loment entire, the lower crenate to subentire; seeds 3–4 mm long, 2.5–3.0 mm wide, brown. Chromosomes: $n = 10$.

Aeschynomene sensitiva is found primarily in wet sites at low elevations from the Antilles, southern Mexico, Central and South America, and has been introduced into the Old World tropics. It is distributed throughout Panama and is distinguished from its closest relative, *A. pratensis* var. *caribaea* by its smaller flowers and the absence of a suture between the stipe and the first article of the fruit.

This species was not typified in the original protologue, but the Plumier illustration is presumably an authentic representation of the species and was proposed as a lectotype by Rudd (1955).

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[11] For a list of synonyms see Rudd (1955). Only the listed names have been used for Panamanian material.

FIGURE 3. *Aeschynomene*—A–E. *Aeschynomene sensitiva* Sw.—A. Habit (×1).—B. Flower (×3½).—C. Corolla.—C^1. Standard (×3).—C^2. Wing petal (×3).—C^3. Keel petal (×3).—D. Stamens (×4).—E. Pistil (×4). [After *Dwyer 2867.*]—F. *Aeschynomene pratensis* var. *caribaea* Rudd. Fruit (×2). [After *Woodson et al. 1768.*]

BOCAS DEL TORO: Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2091* (GH, MO, US). CANAL ZONE: Gamboa, *Allen 1976* (GH, MO, US). Frijoles, *Baltimer 1565, 1567* (both MO). Juan Mina, *Bartlett & Lasser 16766* (GH, MO). Gamboa, *Kennedy et al. 2324* (MO). Frijoles, *Piper 5182* (US). Between Corozal and Ancón, *Pittier 2647* (GH, NY, US). BARRO COLORADO ISLAND: *Bailey & Bailey 300* (F); *Bangham 505* (A, F); *Croat 4199* (MO, SCZ), *13232* (MO); *Kenoyer 386* (US);

Shattuck 624 (F, MO, US); *Starry 256* (F); *Wentmore & Abbe 215* (A, F, GH, MO); *Woodworth & Vestal 401* (A, F, MO). COCLÉ: Ca. 2.5 km S of Antón on old road to Puerto Obaldía, *Lasseigne 4296* (MO). Aguadulce, in savannas near sea level, *Pittier 4918* (US). Between Las Margaritas and El Valle, *Woodson et al. 1768* (US). COLÓN: Miguel de la Borda, *Croat 10019* (MO, PMA). Mouth of Río Piedras, *Lewis et al. 3180* (MO). Penonomé and vicinity, 50–100 ft, *Williams 130* (US). DARIÉN: Without other locality, *Macbride 2706* (F, MO, US). HERRERA: Ocú, *Ebinger 1049* (SCZ). PANAMÁ: Tocumen Airport, *Dwyer 5603* (MO). Chagres, *Fendler 100* (MO, US). Chilibre, *Dwyer 11976* (MO). Las Sabanas, *Heriberto 296* (US). San Jose Island, *Johnston 910* (GH). N of Panama City, *Paul 568* (US). Camino del Boticario near Chepo, *Pittier 4568* (US). Laguna de Portala near Chepo, *Pittier 4611* (US). Las Sabanas, *Standley 25938* (US). Juan Franco race track, *Standley 27818* (US). Old Las Cruces Trail between Ft. Clayton and Corozal, *Standley 29092* (US). Juan Díaz, *Standley 30514* (US). Nuevo San Francisco, *Standley 30753* (US). Between Matías Hernández and Juan Díaz, *Standley 31964* (US). Las Sabanas, *Standley 40770* (US). Capitana, *Taylor 26* (PMA).

9. **Aeschynomene villosa** Poir., Lam. Encycl. Méth. Bot. Suppl. 4: 76. 1816. TYPE: Puerto Rico, *Ledru* (P, not seen).

Herbs; stems usually decumbent, to 2–6 dm long, hispid. *Leaves* 2–7 cm long, 20–50 foliolate; leaflets linear oblong, subfalcate, mostly 3-costate, 3–6 mm long, 0.5–1.5 mm wide; stipules appendiculate below point of attachment, striate, subglabrous, (5–)10–15 mm long, 1.0–1.5 mm wide, usually somewhat hispid at the point of attachment, margins ciliate, attenuate at each end. *Inflorescence* often paniculate, few flowered, peduncles and pedicels hispid, bracts cordate, acuminate, 1.5–6.0 mm long, 1–2 mm wide, ciliate; bracteoles ovate-lanceolate, acute to acuminate, 1–4 mm long, 0.5–1.0 mm wide, ciliate. *Flowers* yellow, 3–5(–7) mm long; calyx 2–4 mm long, hispid; standard 5–7 mm long, claw 1–2 mm long, blade suborbiculate, 4–5 mm wide, entire, wings 5–7 mm long, 1–2 mm wide, keel 4–5 mm long, claws 1.0–1.5 mm long; stamens 4–5 mm long. *Fruit* 3–5(–7) articulate, articles 2.5–3.0(–4.0) mm in diameter, villous-hispid, with trichomes tuberculate based; seeds 2.0–2.5 mm long, 1.5–2.0 mm wide, blackish.

Aeschynomene villosa is distributed from southwestern United States, through Central America into northern South America. It appears to be rare in Panama, having only been collected from two localities. As with other species in this genus, it is called "pega-pega" locally.

CANAL ZONE: Madden Forest Road at entrance to Boy Scout road, *Croat 12907* (MO). Sosa Hill, Balboa, *Standley 25267* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29163* (US). PANAMÁ: Abalaba, *Killip 3367* (US). Near Matías Hernández, *Standley 28893* (US). Río Tocumen, *Standley 29399* (US). VERAGUAS: Divisa/Santiago, *Burt & Rattray 82* (MO, SCZ).

4. ALYSICARPUS

Michael O. Dillon[12]

Alysicarpus Desvaux, Journ. Bot. (Desvaux) sér. 2. 1: 120. 1813. TYPE: *A. bupleurifolius* (L.) DC. = *Hedysarum bupleurifolium* L., type cons.

Herbs; stems ascending to procumbent, terete, striate. *Leaves* alternate, 1-foliolate (rarely 3-foliolate); leaflets linear-lanceolate to oval, reticulate-venose; stipules scarious, acuminate, free or connate; bistipellate. *Inflorescence* race-

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mose, terminal or rarely axillary, bracts scarious, deciduous, pedicels paired, short. *Flowers* small; calyx 5-lobed, deeply divided, lobes unequal, the upper 2 connate nearly to the apex, glumaceous; corolla reddish purple, or rarely orange; the standard obovate to orbicular, clawed; the wings obliquely oblong; the keel slightly incurved, obtuse; stamens 10, diadelphous, upper connate only basally; anthers uniform; ovary sessile or shortly stipitate; ovules numerous; style filiform, incurved at the apex, stigma broadly capitate, terminal. *Fruit* a loment, terete to compressed, submoniliform, indehiscent; seeds suborbicular or globose, smooth, lustrous, estrophiolate. Chromosomes: $n = 8, 10$.

Alysicarpus is a genus of about 30 species, primarily of the Old World tropics, of which we have one, *A. vaginalis* (L.) DC. The genus appears to have no economic importance in the New World except as a noxious weed. However, in Africa Dalziel (1937) reports that various species including *A. vaginalis* are used locally as "a fodder for all kinds of domestic stock, used fresh, but preferably cut after fruiting and stored as hay; regarded as an excellent fodder for horses, but it is said to cause mucous diarrhoea if given in excess in the young and immature state during the rains."

1. **Alysicarpus vaginalis** (L.) DC., Prodr. 2: 353. 1825. non Hochst. ex Baker (1871); non Wall. (1831)—FIG. 4.

Hedysarum vaginale L., Sp. Pl. 746. 1753. TYPE: Ceylon, *Hermann* (?BM, not seen).

Herbs, suberect to prostrate, to 0.5 m tall; stems straw colored to black, glabrescent. *Leaves* unifoliolate, elliptic-orbicular, to 2.5 cm long, ca. 1.5 cm wide, apex rounded, apiculate, obtuse, truncate or subcordate basally, drying green, glabrous above, strigose-villose beneath; stipules erect, often amplexicaul, subulate, to 1.5 cm long, ca. 2 mm wide basally, acute, scarious, ciliolate. *Inflorescence* racemose, terminal, to 10 cm long. *Flowers* purple, ca. 5 mm long; the calyx deeply 5-lobed, the lobes unequal, acuminate, striate, puberulent; the standard obovate, ca. 5 mm long; the wings oblong, ca. 4 mm long, the claw ca. 1.5 mm long, the keel connivent, oblong, ca. 4 mm long; stamens diadelphous, the staminal sheath terete, to 7 mm long, ca. 0.6 mm wide, the filaments alternating in length, the longer filament to 0.6 mm long, the anthers rotund, ca. 0.3 mm long; ovary linear, ca. 3 mm long, ca. 0.5 mm wide, appressed villosulose, the style compressed, geniculate, swollen, the stigma subdiscoidal, truncate. *Fruits* strongly ascending, terete, drying black, puberulent, ca. 6-articulate, articles ca. 2 mm long; seeds ca. 2 mm long, suborbicular, lustrous, reddish brown.

This species is widespread in Panama and easily distinguished by its elliptic-orbicular, unifoliolate leaves and erect, terete loments.

BOCAS DEL TORO: Almirante, *Barrus 403* (GH). Milla 5, *Croat & Porter 16460* (MO). Bocas, *Lazor et al. 2376* (FSU). CANAL ZONE: Gamboa, *Busey 842* (MO). Ft. Kobbe, *Duke 3914* (MO). Toro Point, Ft. Sherman, *Duke 4336* (MO). Sosa Hill, *Duke 4655* (GH, MO). Ft. Clayton, *Dwyer 1001* (FSU, MO, SCZ). Curundu, *Dwyer 1764* (MO). Frijoles, *Ebinger 309* (MO, US). Madden Dam, *Maurice 823* (US). Miraflores Lake, *Tyson 1342* (FSU, MO, SCZ). Ft. Amador, *Tyson 2014* (MO, SCZ). Curundu, *Tyson 6631* (MO). Miraflores Lake, *White 263* (MO, US). CHIRIQUÍ: David airport, *Lewis et al. 739* (MO, NY). Puerto Armuelles, *Liesner 141* (MO, NY). COCLÉ: NE of Río Hato,

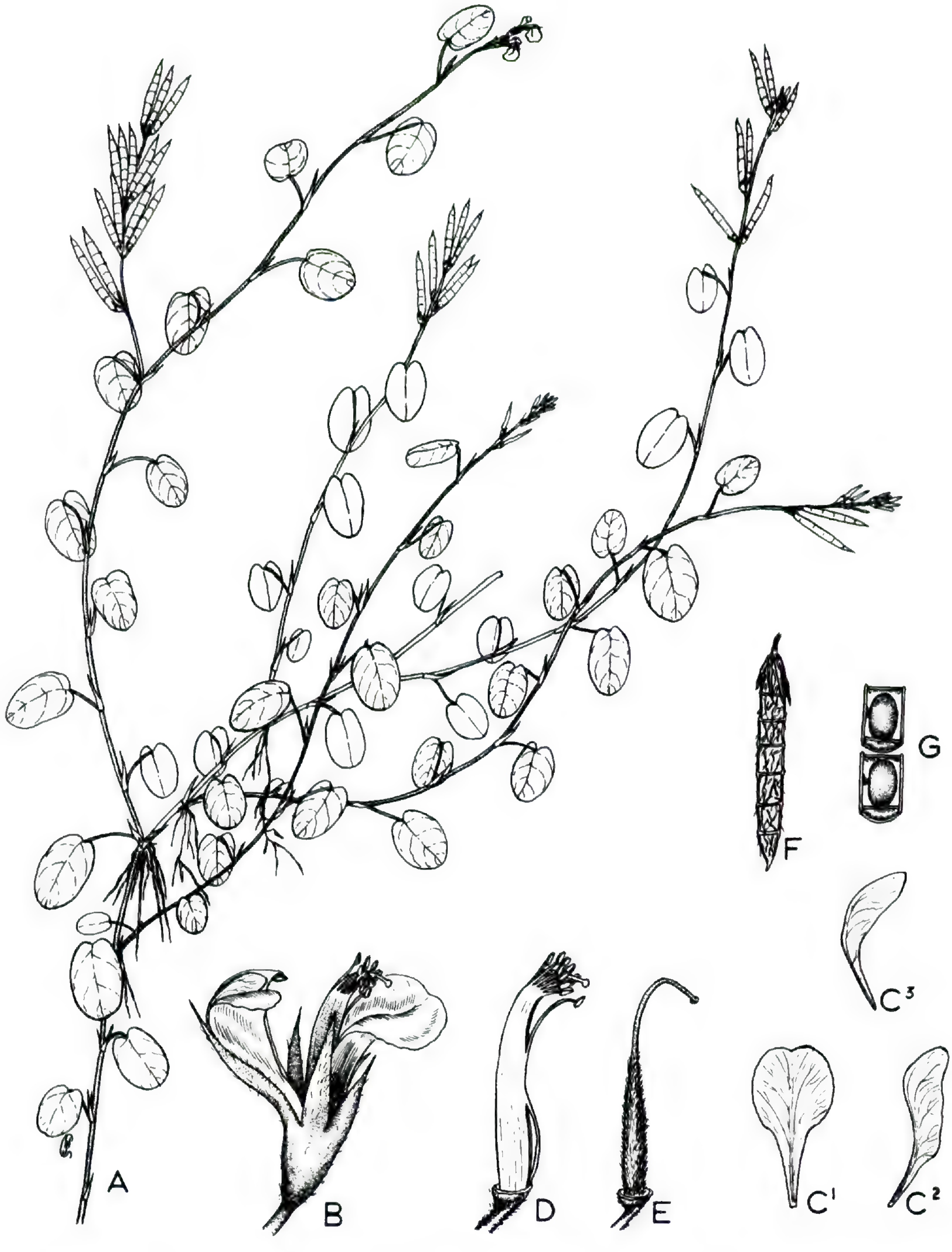

FIGURE 4. *Alysicarpus vaginalis* (L.) DC.—A. Habit (×3/5). [After *White 263.*]—B. Flower (×6).—C. Corolla.—C¹. Standard (×3³/₅).—C². Wing petal (×3/5).—C³. Keel petal (×3³/₅).—D. Stamens (×6).—E. Pistil (×6). [After *Duke 3914.*]—F. Fruit (×1⁴/₅).—G. Sections of fruit with seeds (×3³/₅). [After *White 263.*]

Lasseigne 4293 (MO). COLÓN: Río Piedras, *Blum et al. 2546* (MO, SCZ). Colón, *Correa 1216* (MO). Portobelo to Pilón, *Nee & Mori 3653* (MO, WIS). HERRERA: Los Pozos, *Burt & Koster 94* (MO). PANAMÁ: Río Pacora and Chepo, *Duke 5941* (MO). Riomar, *Duke 12416* (MO, NY); *Ebinger 496* (MO, US). San Jose Island, *Johnston 858* (GH, US). Panama City, *Mendez 112* (US). Between Río

Pacora and Chepo, *Porter et al. 5102, 5134* (both MO, SCZ). Riomar, *Tyson et al. 2319* (FSU, SCZ). SAN BLAS: Point opposite Ilsa Mosquito, *Duke 8993* (MO, NY). VERAGUAS: La Mata, *Koster 118* (MO).

5. ATELEIA

Michael O. Dillon[13]

Ateleia (DC.) Benth., Comm. Legum. Gen. 37, 37. Jun. 1837 (preprint); Ann. Wiener Mus. Naturgesch. 2: 101. 1838. LECTOTYPE: *Ateleia pterocarpa* Moc. & Sesse ex D. Dietr. (Pittier, 1918).

Pterocarpus section *Ateleia* DC., Prodr. 2: 419. 1825; Mém. Légum. 393. 1826.
Ateleia Ses. & Moc. ex DC., Prodr. 2: 419. 1825; Mém. Légum. 394. 1826, nom. in syn.

Unarmed *trees* or *shrubs*. *Leaves* imparipinnate; leaflets alternate to subopposite, subcoriaceous; stipules minute and caducous or none, reduced to tufts of hairs; stipels none. *Inflorescences* racemose, sometimes paniculate, terminal or axillary, 5–20 cm long; bracts small, deltoid or linear, persistent or caducous; bracteoles none. *Flowers* 10–several hundred, 5–14 mm long; calyx regular, campanulate, valvate or subimbricate in bud, truncate or shortly dentate, 5-lobed, the teeth ca. 0.5 mm long; petal 1, white or yellowish, clawed, cucullate, sometimes expanded, spatulate at anthesis, glabrous or pubescent, the margin erose or sinuate; stamens free, the anthers uniform, ellipsoid, ca. 1 mm long, dorsifixed; ovary 1–2 ovulate, the stigma subsessile, ovate, obliquely terminal, inflexed. *Fruit* indehiscent, samaroid, semiorbicular, a narrow wing along the upper suture, 2 valved, usually 1 seeded, compressed stipitate; seeds reniform, compressed, reddish brown to dark brown, the hilum lateral, orbicular or elliptic. Chromosomes: $n = 20$.

Ateleia is composed of about 17 species distributed throughout tropical and subtropical Central and South America. All the species are known from limited ranges with the exception of *A. gummifera*, which ranges throughout the West Indies and the eastern coast of Central America.

Literature:

Mohlenbrock, R. H. 1962. A revision of the leguminous genus *Ateleia*. Webbia 17: 153–186.
Pittier, H. 1918. A new species of *Ateleia* from Colombia. Contr. U.S. Natl. Herb. 20: 113.

1. **Ateleia gummifera** (DC.) D. Dietr.,[14] Syn. Pl. 4: 219. 1847.—FIG. 5.

Pterocarpus gummifer Bert. ex D.C., Prodr. 2: 419. 1925; Mém. Légum. 395. 1826. TYPE: Santo Domingo, *Bertero* (G-DC, holotype; MO, isotype).

Shrub or small *tree* to 7 m tall; branchlets thick, knotty, lenticellate, usually glabrous. *Leaves* alternate, 7–11(–13) foliolate, rachis puberulent, 5–10 cm long,

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[14] For additional synonymy see Rudd (1972).

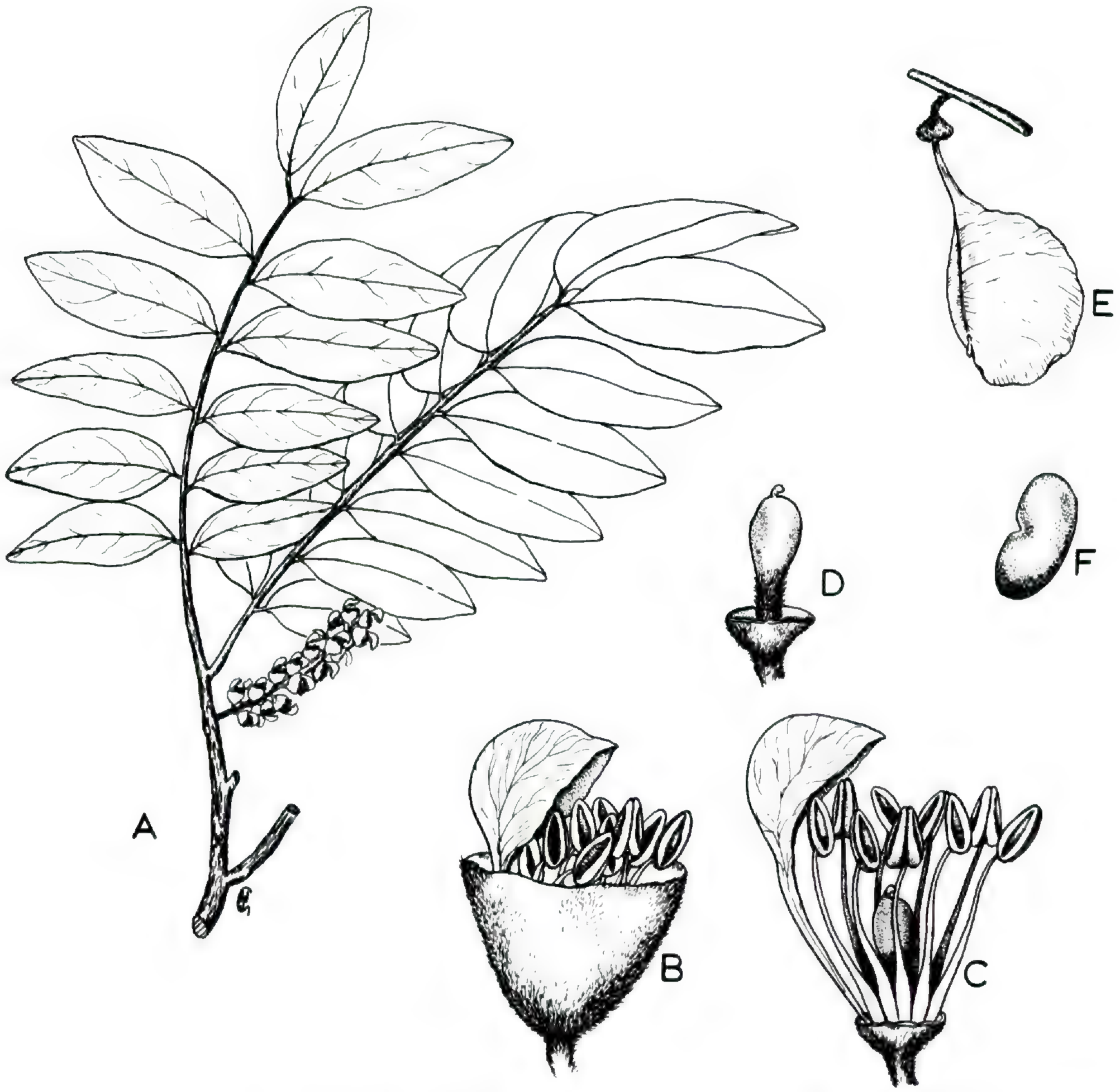

FIGURE 5. *Ateleia gummifera* (DC.) D. Dietr.—A. Habit (×3/5). [After *Allen 4083*.]—B. Flower (×7 1/5).—C. Stamens and petal (×7 1/5).—D. Pistil (×7 1/5). [After *Schipp 705*, Belize.]—E. Fruit (×1 1/5).—F. Seed (×4 4/5). [After *Allen 4083*.]

terete; leaflets subopposite, ovate to elliptic, obtuse, or rarely emarginate, cuneate to obtuse, 3–7 cm long, 1.5–3.0 cm wide, the upper surface glabrate, the lower surface dull white, puberulent, reticulate; petiolules ca. 2 mm long, puberulent. *Inflorescences* racemose, densely flowered, 6–17 cm long; bracts deltoid, commonly 1 mm long. *Flowers* pedicellate, the pedicels 1–2 mm long, villous; calyx campanulate, 2–3 mm long, tomentulose; petal yellow, 5–6 mm long, 2–4 mm wide, cucullate, the claw ca. 3 mm long, the blade suborbicular, irregularly sinuate; stamens 10, unequal; ovary stipitate, compressed, villous at the base, 2 ovulate. *Fruit* glabrous, 2.0–3.5 cm long, 1.0–1.5 cm broad, the wing 1–2 mm wide along the upper margin, the stipe 0.5–1.3 cm long; seed 5–7 mm long, 3.0–3.5 mm broad, ca. 2 mm thick, the hilum ca. 1 mm in diameter. Chromosomes: $n = 20$.

This species is the most widespread element of the genus, occurring throughout the West Indies and from the Yucatan south to Panama, from sea level to

1,000 m. It is infrequently collected and appears rare in Panama. There is considerable variation in leaflet shape and degree of pubescence, but flower and fruit characteristics appear constant throughout its range. No local names or uses are known from Panama; however, it is called "balsamo hediondo" or "cerezo" in Cuba and "tush che" in Belize.

HERRERA: Ocú, *Allen 4083* (MO).

6. BARBIERIA

Peter S. White[15]

Barbieria DC., Prodr. 2: 239. 1825. Mém. Légum. 241. *pl. 39.* 1825. TYPE: *B. polyphylla* DC., nomen illeg. (*Galactia pinnata* Pers., *Barbieria pinnata* (Pers.) Baillon).

Barbiera Spreng., Gen. Pl., ed. 9. 2: 587. 1831. orth. mut.

Woody *vine* or low *shrub*, branchlets hirsute, but pubescence sometimes becoming sparse on older stems. *Leaves* alternate, imparipinnate, many foliolate, the leaflets entire; stipels persistent, long subulate, stipules persistent, narrowly triangular, acuminate. *Inflorescence* of relatively few-flowered racemes, terminal and from upper axils, nodes 2–5 per raceme, 2–3 flowers per node; bracts narrow, acuminate, bracteoles 2 subtending the hypanthium, narrow, acuminate, flowers short pedicelled. *Flowers* large, red; hypanthium tubular, pubescent, persistent in fruit, the teeth 5, long, narrow, acuminate, nearly equal, stiff, at least when dry; petals red, long clawed, glabrous, the standard oblong, the wings oblong, adherent to and shorter then the keel; stamens diadelphous, the vexillary stamen free, the anthers uniform, the ovary sessile, the ovules numerous, the stigma small, terminal, the style elongate, barbate on upper margin. *Fruits* linear, straight, flattened, septate and transversely impressed outside between the seeds, pubescent, the two valves coiling in dehiscence; seeds oblong reniform.

Barbieria is a monotypic genus of tropical America.

1. **Barbieria pinnata** (Pers.) Baill., Hist. Pl. 2: 263. 1870.—FIG. 6.

Galactia pinnata Pers., Syn. Pl. 2: 302. 1807. TYPE: West Indies, not seen.
Clitoria polyphylla Poir. in Lam., Encycl. Méth. Bot. Suppl. 2: 300. 1811. TYPE: Puerto Rico, not seen.
Barbieria polyphylla (Poir.) DC., Prodr. 2: 239. 1825. Mém. Legum. 242. *pl. 39.* 1825.
B. maynensis Poepp. & Endlich., Nov. Gen. Sp. Pl. 3: 58, *pl. 264.* 1845. TYPE: Peru, *Poeppig 2367* (not seen, F frag.).

Woody *wine*, twining, trailing, or suberect, branchlets hirsute. *Leaves* alternate, imparipinnate; leaflets (9–)15–21(–23), elliptic with base and apex rounded, the apex mucronate, 1.5–7.0 cm long, 0.6–2.0 cm wide, surface glabrous to pubescent with minute scattered hairs above, the midrib hairy above, densely hairy and lighter beneath; paired stipels to 4 mm long, narrow; stipules 6–10 mm long, narrow; petiolules 1–3 mm long; petioles 1–4 cm long, hirsute, grooved. *Inflo-*

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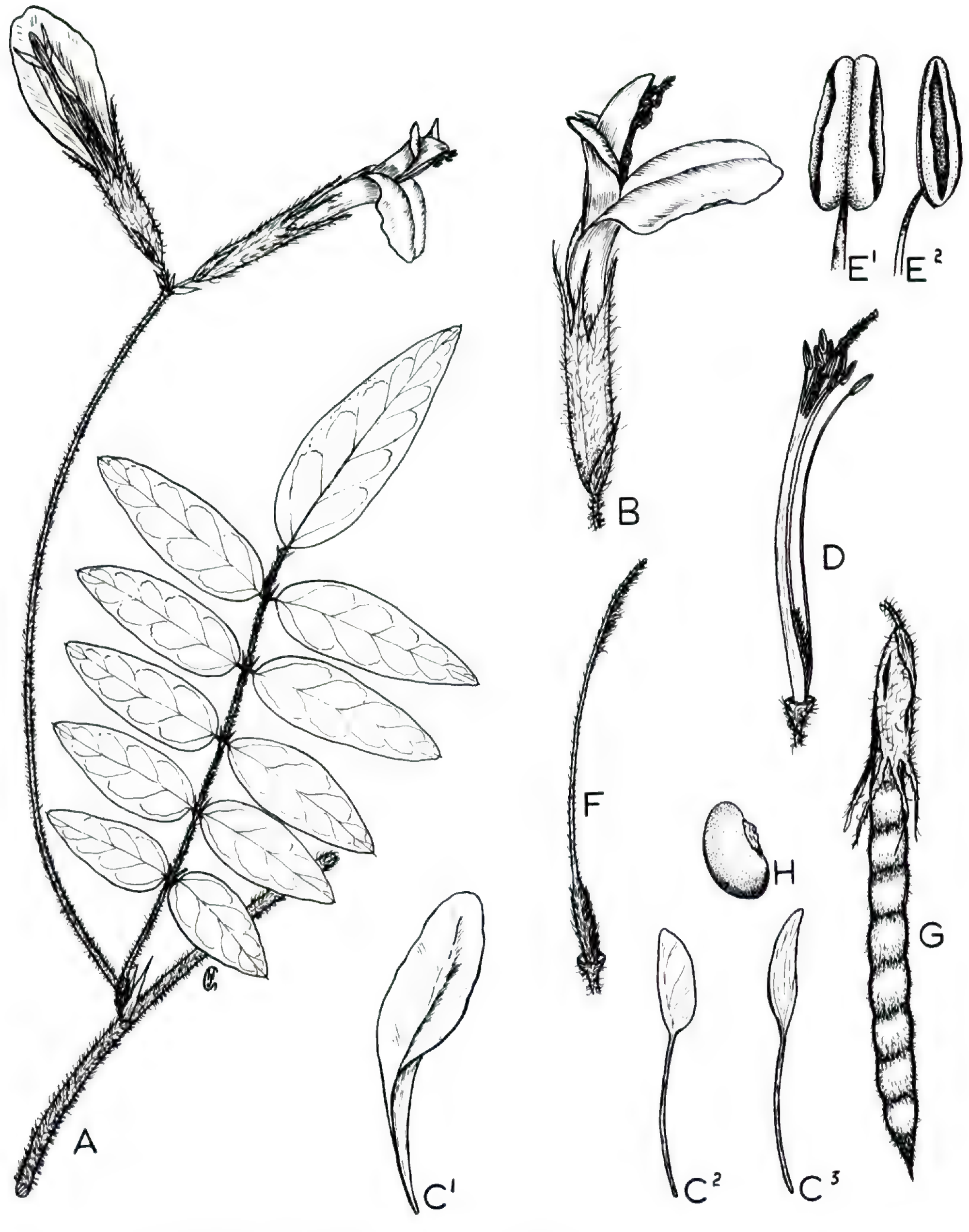

FIGURE 6. *Barbieria pinnata* (Pers.) Baill.—A. Habit (×3/5). [After *Skutch 2263*.]—B. Flower (×9/10).—C. Corolla.—C¹. Standard (×3/5).—C². Wing petal (×3/5).—C³. Keel petal (×3/5).—D. Stamens (×9/10).—E. Anthers.—E¹. Top view.—E². Side view.—F. Pistil (×9/10). [After *Tuerckheim 7845*.]—G. Fruit (×9/10).—H. Seed (×6). [After *Klug 3095*, Peru.]

rescence racemes, occasionally branched, to 25 cm long; flowers 2–3 from paired stipulelike bracts and a third bract between these on the rachis; pedicels ca. 5 mm long; bracteoles ca. 1 cm long at the base of the hypanthium. *Flowers* large, to 5.5 cm long, red; hypanthium ca. 3 cm long, 6 mm broad, densely pubescent

and with scattered longer hairs, the 5 teeth ca. ½ as long as the tube, ca. 1 cm long, narrow lanceolate acuminate; petals glabrous, standard to 5.5 cm long, ca. 1.5 cm wide, wedge shaped at the base, clawed, wings and keel petals all ca. 4.5 cm long, abruptly contracted to a claw, keel oblong; staminal column ca. 5 cm long, open above, glabrous; ovary sessile, ca. 7 mm long, terete, silvery pilose, ovules several, the stigma capitate, the style ca. 4 cm long, heavily bearded on upper margin. *Fruit* linear, ca. 5 cm long, 0.6 cm wide, compressed, pubescent, septate inside and indented on the outside between the seeds, 2 valves coiling in dehiscence; seeds 4–9, small, dark brown or black.

Barbieria pinnata, the only species in the genus, is found from Mexico to South America and in the West Indies. It has not yet been found in Panama, but is known from bordering countries and likely occurs there. Judging from the number of collections in major herbaria, *Barbieria pinnata* may be infrequent or rare throughout its range. The large red flowers make the plant showy when it is in bloom.

Barbieria pinnata is distinctive for its large blood-red flowers, clawed petals, long tubular calyx with sharp, equal calyx teeth, its long and hairy style, its long (to 1 cm) and narrow stipules, and its bracts and bracteoles.

7. CAJANUS

Muriel E. Poston[16]

Cajanus DC., Cat. Hort. Bot. Monspel. 85. 1813. nom. conserv. TYPE: *Cajanus cajan* (L.) Millsp.

Cajan Adans. Fam. Pl. 2: 326. 1736. Based on *Cytisus cajan* L. = *Cajanus cajan* (L.) Millsp.

Shrub or subshrub. *Leaves* trifoliolate, leaflets oblanceolate, puberulent; stipules lanceolate, caducous. *Inflorescence* an axillary or terminal panicle or raceme, flowers 6–12 per rachis; bracts small, caducous. *Flowers* with calyx campanulate, 5-lobed, the upper lobe longer; corolla yellow with brown to maroon striation, the standard ovate, auriculate, the wing oblong, the keel falcate; stamens diadelphous, the vexillary stamen free, the anthers monomorphic; ovary sessile with 4–6 ovules, the style slender, glabrous, the stigma capitate. *Fruit* oblong, 2-valved with oblique constrictions between the seeds, yellowish green with brown mottling, puberulent; seeds 4–5, obovoid, hilum oblong, estrophiolate.

Cajanus is an Old World genus of 1 or 2 species widely spread through Africa and Asia and has been introduced into the New World in cultivation.

1. **Cajanus cajan** (L.) Millsp. Publ. Field Columbian Mus., Bot. Ser. 2: 53. 1900.—FIG. 7.

Cytisus cajan L., Sp. Pl. 739. 1753. TYPE: India, herb Linnaeus (LINN 912:4, not seen; photo, MO).
Cajanus bicolor DC., Cat. Hort. Bot. Monspel. 85. 1813. TYPE: not seen.
Cajanus indicus Spreng. Syst. Veg. 3:248. 1826. TYPE: not seen.

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FIGURE 7. *Cajanus cajan* (L.) Millsp.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×2).—E. Pistil (×2½). [After *Hunter & Allen 70.*]—F. Fruit (×½).—G. Opened fruit with seeds (×½). [After *Greenman & Greenman 5194.*]

Shrub or subshrub; stems angular, striate, strigose. *Leaves* trifoliolate; leaflets oblanceolate lanceolate, 4.3–8.2 cm long, 1.2–3.2 cm wide, the terminal leaflet slightly longer than the lateral leaflets, apically acute, basally cuneate, the margins revolute, velutinous and gland dotted beneath, glabrous above; petiolules 0.4–1.0 cm long, the lateral leaflets subsessile; petioles 0.6–1.2 cm long, angled, puberulent; stipules lanceolate, 2.0–5.0 mm long, strigose; stipels linear to subulate,

ca. 1.0 mm long. *Inflorescence* with racemes 4.0–9.0 cm long, 5–6 (–12)-flowered; peduncles 2.0–4.0 cm long, strigose; pedicel 0.6–0.8 mm long, strigulose; bracts subtending the flowers ovate, 0.5–0.7 cm long, 0.3 cm wide, caducous. *Flowers* with the calyx 0.8–1.0 cm long, not exceeding the corolla, puberulent, the upper lobes of the calyx partly united; corolla yellow striped with maroon or brown, 1.0–1.6 cm long, the standard obovate, 1.3–1.5 cm long, 1.4–1.5 cm wide, auriculate, the claw ca. 2.0 mm long, the wing oblong, 1.3–1.4 cm long, 0.5–0.7 cm wide, the claw ca. 4.0 mm long, the keel falcate, not auriculate, 1.2–1.5 cm long, 0.5–0.7 cm wide, the claw 0.5 cm long; stamens 1.3–1.4 cm long, vexillary stamen free; style 1.2–1.3 cm long, the stigma capitate. *Fruits* oblong, 5.5–7.0 cm long, 0.8–1.0 cm wide, green with brown mottling, puberulent, the beak 0.7–1.0 cm long, the compressions between the ovules oblique; seeds 4–5, ovoid, brown with white mottling, 5.0 mm long, 6.0 mm wide, the hilum linear.

Cajanus cajan is cultivated for its edible seeds known locally as Guandú, Guandul or pigeon-pea. It is found in tropical moist forest in Panama or where cultivated.

BOCAS DEL TORO: 10–15 mi S from mouth of Changuinola River, *Lewis et al. 929* (MO). CANAL ZONE: Between Miraflores and Panama, *Blum 2077* (MO). Without other locality, *Crawford 438* (NY). Barro Colorado Island, *Croat 4670* (SCZ), *7238* (DUKE, MO, NY, SCZ, US). Diablo Heights, *Gale*, Dec. 7, 1962 (SCZ). Corozal, *Greenman & Greenman 5194* (MO). CHIRIQUÍ: 2 km N of Punta de Purical, Burica Peninsula, *Busey 761* (MO). COCLÉ: El Valle de Antón, *Hammel 1746* (MO); *Lewis et al. 2589* (DUKE, MO). Penonomé, *Williams 360* (NY). COLÓN: Without other locality, *Wedel* Feb. 23 1940 (MO). DARIÉN: Upper Río Tuquesa, *Le Clezio 109* (MO). PANAMÁ: Isla del Rey, *Duke 9504* (DUKE, MO). Sabanas near Chepo, *Hunter & Allen 70* (MO). SE slope of Cerro Jefe, *Tyson 3551* (SCZ). Santa Clara, *Tyson & Blum 1884* (FSU, MO, SCZ). Cerro Azul, *Tyson et al. 6045* (FSU, SCZ). Cerro Campana, *Wilbur 24371* (DUKE). Pacora, *Williams 770* (NY). LOCALITY UNKNOWN: Tabernilla, *Cowell 283* (NY). Aspinwall, *Hayes 642* (NY).

8. CALOPOGONIUM

W. G. D'Arcy[17]

Calopogonium Desv., Ann. Sci. Nat. (Paris) ser. 1(9): 423. 1826. TYPE: *C. mucunoides* Desv.

Erect or climbing perennial *herbs*, often robust. *Leaves* pinnate trifoliolate, stipels and stipules scale-like. *Inflorescences* axillary *racemes* or fascicles, the rachis, when present, nodose with flowers in small fascicles on the nodes; pedicels short or long, bracts and bracteoles small, sometimes caducous. *Flowers* sometimes showy, the calyx campanulate tubular, 5-toothed, the upper pair fused partway up, forming a lip, the lower 3 lanceolate; corolla pink, white or violet, narrow, the standard obovate with inflexed basal auricles, the wings and keel narrow; stamens diadelphous, the vexillary stamen free, the other filaments united halfway or less, the anthers 8–9, all alike, ellipsoidal, glabrous, dorsifixed; ovary sessile, hirsute, ovoid, many-ovulate, the style slender, incurved, glabrate, especially above, the stigma capitate globose or compressed. *Legume* linear oblong, compressed, 2-valved, demarcated between the seeds, elastically dehiscent; seeds several, ovoid, aril wanting.

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Calopogonium is a genus of 6–8 species mainly centered in South America, but extending into Central America and introduced and naturalized in the Old World tropics.

There are reports that plants in this genus are toxic to livestock, and in some countries they have been used as insecticides. In Central America, the vines are sometimes used to scour pots.

a. Leaflets glabrate above; inflorescences fasciculate, pedicels more than 4 mm long; corolla pilose outside; seeds greenish ---------- 2. *C. galactioides*
aa. Leaflets pubescent overall; inflorescence racemose, pedicels less than 4 mm long; corolla glabrate outside; seeds brownish.
b. Stems soon becoming fine puberulent or glabrate; bracteoles ca. 2 mm long, not exceeding the calyx tube, early caducous; pods more than 5 mm wide ---------- 1. *C. coeruleum*
bb. Stems remaining long pilose velutinous; bracteoles 4–6 mm long, nearly as long as the calyx lobes, mostly persistent in flower; pod less than 5 mm wide ---------- 3. *C. mucunoides*

1. **Calopogonium coeruleum** (Benth.) Sauv., Ann. Acad. Habana 5: 337. 1869.—FIG. 8.

Stenolobium coeruleum Benth., Ann. Wiener Mus. Naturgesch. 2: 125. 1838. TYPE: not seen.

Vine, sometimes becoming large, yellowish pubescent, stems slender, softly villous with stout hairs to 2 mm long, these soon deciduous leaving a dense soft pubescence of short hairs. *Leaves* pinnate trifoliolate, leaflets ovate or rhomboidal, mostly 6–9 cm long, 4–6 cm wide, the lateral pair oblique, obtuse at each end, mucronate, mostly 3 veined at the base, slightly discolorous, appressed fine pubescent on both sides but more so beneath; petiolules 2–4 mm long; rachis 1–4 cm long; petiole mostly somewhat shorter than the terminal leaflet; stipels subulate, pilose, ca. 4 mm long; stipules caducous. *Racemes* elongate, sturdy but flexuous; peduncle mostly 1–5 cm long, puberulent; rachis to 20(–40) cm long, nodose, the nodes sometimes elaborated into short cymes; pedicels tomentose, ca. 2 mm long, inserted on the nodes, 2–5 at a time; bracts 1–3 mm long, pilose. *Flowers* bluish, the calyx tubular campanulate, ca. 4 mm long, the lobes subulate acuminate, pilose, about as long as the tube; standard glabrous, ca. 1 cm long, the wings narrowly spatulate oblong, about as long as the standard, the keel shorter; anthers oblong ovoid, 0.6 mm long; style ascending, pubescent to the tip. *Legume* linear oblong, 4–6 cm long, ca. 8 mm wide, impressed between the seeds laterally and slightly marginally, the beak small, curved, softly fine tomentose on the sides with longer hairs along the margins; seeds 4–8, squarish discoid, 4–5 mm across, shiny brown, the hilum oval, centered on one edge.

BOCAS DEL TORO: Water Valley, *Wedel 1814* (GH, MO, US). Old Bank Island, *Wedel 1981* (GH, MO, US). CANAL ZONE: Victoria Fill near Miraflores Locks, *Allen 1709* (GH, MO, US). Galen Point, Atlantic side, *Blum & Dwyer 2151* (FSU, MO, SCZ). Paraiso, *Croat 7152* (MO). Pipeline road 2½ mi from Gamboa Gate, *Croat 9359* (NY). Near Paraiso, *Croat 13255* (F, MO, NY, SCZ). Summit naval radio station, *Croat 14244* (MO). Albrook Tropic Test Site, *Dwyer 7314* (MO). C-12 Road, *Dwyer 8384* (MO). France Field, *Dwyer 8533* (MO). Near officers' club, Margarita, *Gentry 4833* (MO, PMA). Balboa Heights, *Greenman & Greenman 5053* (MO). Paraiso Station, *Hayes 113, 118* (both NY). Gatún, *Hayes 491* (NY). Barro Colorado Island, *Hladick 136* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 680,* (GH, MO), *742* (MO). ? Madden dam, 80 m, *Nee 7774* (MO). Valley of Masambí, road to Las Cascadas Plantation, 20–100 m, *Pittier 2669* (GH, NY, US). Quebrada Melgada, *Steyermark 17490* (GH, MO). Barro Colorado Island, *Woodworth & Vestal 443* (A, F, MO). CHIRIQUÍ: 20 km N

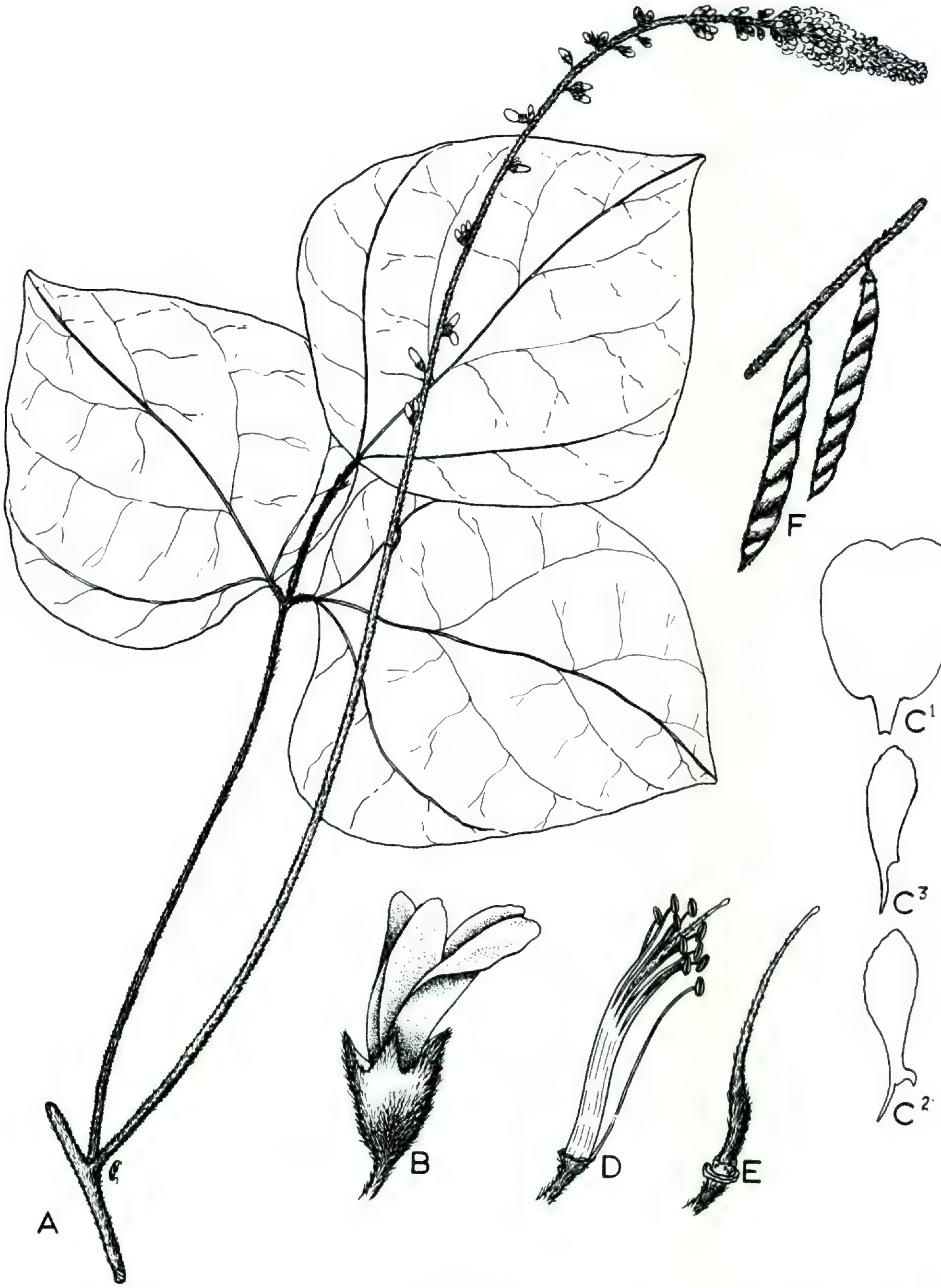

FIGURE 8. *Calopogonium coeruleum* (Benth.) Sauv.—A. Habit (×½).—B. Flower (×2½).—C. Corolla.—C¹. Standard (×5).—C². Wing petal (×2).—C³. Keel petal (×2).—D. Stamens (×3).—E. Pistil (×3). [After *Wedel 1956.*]—F. Fruit (×½). [After *Allen 1709.*]

of Puerto Armuelles, *Busey 408* (MO). Rabo de Puerco, 10.5 km W of Puerto Armuelles, *Busey 520* (F, GH, MO, NY). Quebrada Guanabanito beyond La Represa, 2 mi SW of Puerto Armuelles, 0–200 m, *Croat 22066* (F, GH, MO, NY). 4 mi from Paso Canoas on road to Cañas Gordas, *Croat 22221* (F, GH, MO). Quebrada Quanabano, 0–100 m, *Croat 22533* (MO). Las Vueltas-Boca del Monte, 0–

100 m, *Koster 111* (MO). Boquete, *Lewis et al. 618* (NY). COCLÉ: Road to El Valle close to Panamerican Highway, *Burt & Rattray 34* (MO). ca. 2 km de el Copé en la Madera, *Taylor 971* (PMA). Bismark above Penonomé, *Williams 597* (NY, US). DARIÉN: Pinogana, 20 m, *Allen 4278* (GH, MO). Isla Casaya, *Duke 10388* (MO, NY, US). Yaviza, 50 m, *Gentry & Mori 13513* (MO, NY). Manené, *Kirkbride & Bristan 1567* (MO). HERRERA: Chupampa, *Burt & Koster 86* (MO). 4 mi S of Los Pozos, *Tyson 2704* (FSU, MO). 10 mi S of Ocú, *Tyson et al. 2814* (MO, SCZ). LOS SANTOS: 4 mi SE of Posos, *Tyson 2704* (MO). PANAMÁ: Límite de Panamá-Zona del Canal, *Carrasco 41* (F, MO, PMA). Campo Experimental de Monte Oscuro, 10 m, *Correa 1920* (PMA). Cerro Jefe, 2700 ft, *Dwyer 8533* (MO). Capira, *Foster 2128* (F, MO, PMA, US). Sabanas near Chepo, *Hunter & Allen 100* (GH, MO). Agricultural Station at Matías Hernández, *Pittier 6956* (NY, US). La Capitana al lado del potrero, *Taylor 21* (PMA). Carretera de la Urbanizacion Chanis, Vía Cincuentenario, *Taylor 47* (PMA). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 71* (MO). 1–2 mi above Santa Fé, *Gentry 3054* (MO, PMA). Cañazas, *Tyson 3653* (MO). 8 mi S of Santiago, *Tyson 60443* (FSU, MO, SCZ).

2. **Calopogonium galactioides** (H.B.K.) Hemsl., Biol. Centr. Amer., Bot. 1: 301. 1880.

Glycine? galactioides H.B.K., Nov. Gen. Sp. Pl. 6:427. 1823. TYPE: Venezuela, not seen.
Stenolobium galactoides Benth.; Ann. Wiener Mus. Naturgesch. 2: 125. 1838. TYPE: not seen.
Galactia belizensis Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 133. 1932 fide Standley & Steyermark 24(5): 172. 1946. TYPE: British Honduras, *Bartlett 11449* (F, not seen).

Slender climbing *vine*; stems villous with ascending yellowish hairs, glabrescent. *Leaves* pinnate trifoliolate, the leaflets ovate or elliptical, mostly 2–4 cm long, 1.3–2 cm wide, obtuse at both ends, mucronate, the costa prominent above with ca. 4 arcuate veins on each side, glabrate above, appressed pilose beneath; petiolules 1–1.5 mm long, drying dark, pubescent; rachis to 9 mm long; petiole often longer than the terminal leaflet; stipels to 1 mm long pilose, caducous; stipules pilose. *Inflorescences* axillary fascicles of 2–5 flowers; pedicels ca. 5 mm long, puberulent; bracteoles 1–2 mm long, subulate, pubescent. *Flowers* white, pink or purplish, calyx ca. 5 mm long, villous hispid with coarse hairs, divided about halfway, the teeth acuminate subulate; corolla pilose outside, the standard emarginate, about twice as long as the calyx. *Fruit* linear oblong, 2–3 cm long, ca. 3 mm wide, nearly straight, compressed, falsely septate between the seeds, the beak 1–2 mm long, nearly straight; seeds plump, rectangular, dull greenish, 3 mm long, the hilum circular, located on one edge.

Calopogonium galactioides is amply distinct in a number of ways: fasciculate inflorescences, pilose corolla, and glabrous leaflet uppersides as well as in overall appearance which is of a delicate, small leaved vine. It is known in Panama only from western Chiriquí. The species ranges from southern Mexico to northern South America.

CHIRIQUÍ: Cuesta de Piedras, 730 m, *Burt & Koster 161* (MO, SCZ). San Bartolo Limite near Costa Rican border, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22193* (F, GH, MO, NY). Volcán de Chiriquí, Boquete District, 7000 ft, *Davidson 963* (GH, MO).

3. **Calopogonium mucunoides** Desvaux, Ann. Sci. Nat. (Paris) sér. 1. 9: 423. 1826. TYPE: ?Guyana, not seen.

Stenolobium brachycarpum Benth. in Seem., Bot. Voy. Herald 109. 1838. TYPE: Panama, Panama to Santiago, *Seemann* (?K, not seen).
Calopogonium orthocarpum Urb., Symb. Ant. 1: 327. 1899. SYNTYPES: Puerto Rico, *Krug 366*, *Sintenis 817*, *1097* none seen, *3622* (MO), *5534*, *Stahl 976*, none seen.

Slender, sometimes wiry *vines,* twining or trailing, stems pilose with spreading golden hairs ca. 1 mm long. *Leaves* pinnate trifoliolate, the leaflets chartaceous, ovate, mostly 2–6 cm long, mucronulate, obtuse at both ends, lateral leaflets sometimes slightly oblique, the major veins prominent beneath, appressed pilose, more so beneath; petiolules ca. 3 mm long, tomentose; rachis mostly 5–15 mm long; petioles mostly longer than the terminal leaflet; stipels ca. 4 mm long, pubescent; stipules ovoid, ca. 3 mm long, pilose. *Racemes* slender, peduncles short in flower, elongate, 3–12 cm long in fruit, the rachis not expanded, flowers in fascicles of 2–6, becoming distant in fruit, pedicels 1–2 mm long, appressed pubescent; bracts and bracteoles narrowly ovate, to linear, striate, long pilose, ca. 4 mm long. *Flowers* blue or purple, inconspicuous or rarely showy, the calyx 4–7 mm long, deeply 4-fid, the lobes narrow, pilose, the sinuses somewhat exceeded by the bracts, the upper pair fused basally, basally deltoid, apically subulate; corolla with the standard 7–10 mm long, emarginate, slightly exceeding the wings, the keel shorter, curved; ovary villous, the style glabrous. *Legume* linear oblong, flat, mostly 2–3 cm long, ca. 4 mm wide, mostly straight, the beak 1–2 mm long, softly pilose with coarse reddish brown hairs, sometimes laterally impressed between the seeds; seeds 3–8 dark yellowish or reddish brown, compressed squarish, 2–3 mm long, the hilum circular, central on one edge.

This species is distinct in its hairy pods. They are transversely impressed and falsely septate between the seeds, but the transverse ridges are mostly hidden by the pubescence. Although reported to be sometimes showy in nature, on the herbarium sheet the flowers are seldom well preserved and are inconspicuous.

BOCAS DEL TORO: Railroad, Changuinola Valley, *Dunlap 385* (F, US). CANAL ZONE: Chiva Chiva, tower site, *Correa 490* (MO, PMA, SCZ). Barro Colorado Island, *Croat 6925* (MO, PMA, SCZ), *9104* (MO, SCZ). Pipeline Road NW of Gamboa gate, *Croat 12746* (MO, SCZ); *D'Arcy 10615* (MO). Frijoles near railroad station, *Croat 13220* (MO). Barro Colorado Island, *Croat 6925* (SCZ), *9104* (SCZ), *13169A* (MO). Corrosion lab, Miraflores Locks, *Dwyer 3037* (MO). Cocoli, *Dwyer 7207* (GH, MO). Chagres, *Fendler 79* (GH, MO). Outskirts of Ancón, *Greenman & Greenman 5070* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 736* (GH, MO). La Boca, *Mori & Kallunki 3677* (MO). Road C 29 6 km E of Gamboa, 190 m, *Nee 9001* (MO, US). ½ mi W of Summit Gardens, *Nee 9495* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Nowicke et al. 3587* (MO). Between Corozal and Ancón, 10–30 m, *Pittier 2174* (NY, US). Balboa Station, *Porterfield 1933* (NY). E end of air strip, Albrook Air Force Base, *Tyson & Lazor 6010* (FSU), CHIRIQUÍ: Concepción, *Baltimer 1526* (MO). Quebrada Guanabanito, 1 km W of dam at La Represa, *Busey 486* (F, MO). Puerto Armuelles, *Busey 507* (MO). Quebrada de Vuelta, *Busey 622* (MO). San Bartolo Limité, 10–11 mi W of Puerto Armuelles, *Croat 22021* (MO). Puerto Armuelles in bananas, *D'Arcy 10075* (MO). David airport, 25 ft, *Lewis et al. 766* (GH, MO). Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 22* (MO, NY). COCLÉ: Río Hato airstrip *Burch et al. 1130* (GH, MO, NY). Foot of Cerro Pilón above El Valle de Antón, 2000 ft, *Porter et al. 4596* (MO, NY, SCZ). COLÓN: Santa Rita 4 km desviación de la Transistmica, 150 m, *Gomez-Pompa et al. 3220* (MO). HERRERA: Las Minas, 340 m, *Burt & Koster 93* (MO). LOS SANTOS: Between Tonosí and Macaracas, *Oliver et al. 3539* (MO). 12 mi S of Macaracas, *Tyson et al. 3073* (GH, MO, SCZ). PANAMÁ: 1 mi E of Tocumen airport on side road off Panamerican Highway, *Blum & Tyson 1959* (FSU, MO, SCZ). Calzada Larga, *Carrasco 45* (MO, PMA). Campo Experimental de Monte Oscuro 12 km de Capira, 10 m, *Correa 1928* (PMA). Between Chepo and El Llano, *Croat 14493* (MO). Between Río Bayano Dam and Cañitas, *D'Arcy 9406* (MO). Hills between Capira and Potrero, 80–130 m, *Dodge & Hunter 8602* (MO), *8608* (MO). Sabanas near Chepo, *Hunter & Allen 77* (MO). SE slope of Cerro Campana, *Lewis et al. 3102* (MO). Las Cumbres, *Muñoz 18* (MO, PMA). 1 km S of Madden Dam, *Nee 8902* (MO). Sabanas N of Panama City, *Paul 534* (US). Bella Vista, *Standley 25400* (US). Bella Vista, *Standley 25400* (US). Las Sabanas, *Standley 25893* (US). La Garrapata, *Taylor 14* (PMA). 1 mi W of Bejuco on Panamerican Highway, *Tyson & Blum 2545* (FSU, MO, SCZ). VERAGUAS: 1 mi W of Santiago along old Interamerican Highway, *Tyson 5182* (FSU, PMA).

9. CANAVALIA

W. G. D'Arcy[18]

Canavalia DC.,[19] Prodr. 2: 403. 1825. TYPE: *C. ensiformis* (L.) DC. Nom. cons. contra *Canavali* Adans.

Canavali Adans., Fam. Pl. 2: 325, 531. 1763. TYPE: *Dolichos ensiformis* L. = *Canavalia ensiformis* (L.) DC. nomen rejic. contra *Canavalia* DC.

Wenderothia Schlecht., Linnaea 12: 330. 1838. TYPE: *W. discolor* Schlecht. = *Canavalia villosa* Benth.

Twining *vines*, prostrate, clambering or high climbing, rarely more or less erect subshrubs, mostly perennial, somewhat woody; stems often sturdy, mostly pubescent. *Leaves* alternate, pinnate trifoliolate, the leaflets mostly nearly symmetrical, ovate or elliptical, sometimes broad, mucronulate, rarely emarginate, mostly pubescent on both sides, pinnately veined, the principal veins and costa slender and elevated beneath; petiolules 5–7 mm long, mostly pubescent with stiff ascending hairs; petioles equalling or shorter than the terminal leaflet; stipels minute and caducous; stipules caducous. *Inflorescences* axillary racemes, mostly 10–60 cm long, pendant or prostrate and ascending; peduncles with swollen nodes each bearing 2–6 pedicels; bracts caducous; bracteoles rotund to acute, caducous; pedicels mostly 1–3 mm long, the flowers mostly resupinate. *Flowers* showy, somewhat fragrant; the calyx tubular or campanulate, bilabiate, the upper lip sometimes forming a short beak, and when pressed appearing either entire or emarginate, the lower lip of 3 minute teeth, the lateral pair often rotund, the lowest tooth mostly pointed; corolla white, purplish, bluish, pink or red, sometimes with white or yellow markings, the standard obovate, reflexed, emarginate (subgenus *Wenderothia*) or entire, the wings free, narrow, auricled, the keel ascending, united, auricled; stamens mostly united, the vexillary stamen sometimes more or less free; stigma capitate, the ovary pubescent. *Legume* 6–40 cm long and 1.5–5 cm wide, oblong, often falcate when young, apically beaked, sometimes stipitate, coriaceous or becoming woody, mostly compressed, with prominent longitudinal ridges and 1 or 2 (3) ridges on the valves, dehiscent, sometimes explosively, the valves often twisting, pubescent or glabrescent; seeds numerous imbedded in a papery endocarp, sometimes buoyant, brown, mottled or white, mostly ellipsoidal and somewhat compressed, the hilum peripheral, short or long, 7–35 mm long.

Canavalia is recognizable by its large, often woody oblong pods, and by the sturdy stems. The calyx is diagnostic with its often beaked upper lip and minute 3-toothed lower lip. The genus is pantropical in distribution with about 30 species in the New World and about 15 species in the Old World, mostly from the eastern Indian Ocean area and the western Pacific. A few species also occur in Hawaii. Only one species, *C. maritima*, is pantropical, a common element of beaches and coastlines, but at least two species are cultivated as experimental forage crops. *Canavalia ensiformis* was cultivated for food in pre-Colombian America.

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[19] Other synonyms are given by Sauer (1964); only these names relate directly to Panamanian plants.

Literature:

Sauer, J. 1964. Revision of *Canavalia*. Brittonia 16: 106–181.

a. Leaflets nearly circular, emarginate; terminal petiolule often more than 5 mm long; pedicels commonly 3 mm long; plants common on beaches and coastal rocks ---------- 7. *C. maritima*
aa. Leaflets narrower, pointed; terminal petiolule mostly less than 5 mm long; pedicels mostly less than 2.5 mm long; plants occurring behind beaches and inland.
  b. Calyx more than 15 mm long, lowest tooth mostly over 2.5 mm long; leaves mostly copiously pubescent, at least beneath ---------- 9. *C. villosa*
  bb. Calyx less than 15 mm long, lowest tooth less than 2.5 mm long; leaves often glabrate beneath.
    c. Lowest calyx tooth shorter than the lateral teeth.
      d. Pod with 2 extra longitudinal ridges spaced well away from the sutural ridge, pubescent overall at maturity, upper calyx lip shorter than the tube, the lowest tooth less than 2 mm long ---------- 1. *C. bicarinata*
      dd. Pod with one extra sutural ridge spaced near the sutural ridge, glabrate at maturity; upper calyx lip as long as the tube, the lowest tooth over 2 mm long ---------- 3. *C. dictyota*
    cc. Lowest calyx tooth longer than the lateral teeth.
      e. Seeds red or white; pedicels sometimes 2 mm long or more; cultivated species.
        f. Seeds white; hilum less than ½ as long as the seed; the lowest calyx tooth ca. 2.5 mm long ---------- 4. *C. ensiformis*
        ff. Seeds red or pink, hilum more than ½ as long as the seed; the lowest calyx tooth ca. 1.5 mm long ---------- 6. *C. gladiata*
      ee. Seeds brown; pedicels 2 mm long or less; wild species.
        g. Pods with extra ridge(s) spaced well away from the sutures; lowest calyx tooth less than 2 mm long.
          h. Pod with two extra ribs, evenly pubescent at maturity; seeds ca. 9 mm long ---------- 1. *C. bicarinata*
          hh. Pod with 1 extra rib, glabrescent; seeds ca. 17 mm long ---------- 8. *C. oxyphylla*
        gg. Pods with extra ridge near (to 6 mm) the sutural ridges; lowest calyx tooth mostly more than 2 mm long.
          i. Upper calyx lip forming a distinct beak or umbo ---- 5. *C. glabra*
          ii. Upper calyx lip emarginate, not forming an umbo ---------- 2. *C. brasiliensis*

1. **Canavalia bicarinata** Standley, Contr. U.S. Natl. Herb. 18: 106. 1916. TYPE: Panama, *Pittier 2354* (US, holotype, not seen; GH, NY, isotypes).

Wenderothia bicarinata (Standley) Piper, Contr. U.S. Natl. Herb. 20: 578. 1925.

Trailing *vine*; stems sparingly pubescent with ascending weak, brownish or white hairs. *Leaves* pinnate trifoliolate, leaflets to 15 cm long, 9 cm wide, ovate, apically obtuse or short acuminate, basally rounded, chartaceous, drying slightly discolorous, sparingly pubescent to villose with short hairs on 1 or both sides. *Inflorescence* axillary, 4–15 cm long, bracteoles rotund, ca. 1 mm long, pedicels wanting or to 1.5 mm long. *Flowers* red or rose; calyx ca. 12 mm long, tubular, pubescent with short, straight hairs, the upper lip short, apiculate, the lowest tooth ca. 1.5 mm long, pointed, slightly longer than the lateral teeth; standard 3 cm long. *Legume* mostly less than 15 cm long, woody, oblong with a short downcurved beak, sessile or short stipitate, ca. 2 cm wide, longitudinally ridged on the sutures and each valve with 2 additional ridges almost equidistant, pilose when young, maturing with fine even gray pubescence between the ridges; seeds ca. 9 mm long, ovoid or ellipsoidal, dark brown, mottled, the hilum ca. 7 mm long, ca. ¾ the length of the seed.

This species is distinct in its pods which have 2 longitudinal ridges in addition to those over the sutures, thus giving an appearance of evenly spaced ridges. The pods are usually grayish pilose when young and fine pubescent overall when mature. The upper calyx lip is short in relation to the tube.

Canavalia bicarinata occurs in Panama, Colombia, Peru and Ecuador. In Panama it is found at low elevations.

CANAL ZONE: Boy Scout road, Madden Dam area, *Dwyer 11971* (MO); *Mori et al. 4069* (WIS). Ft. Clayton, 1 mi on old Albrook Tower road, *Tyson & Dwyer 6504* (SCZ). CHIRIQUÍ: Monte Verde 2.5 km W of Puerto Armuelles, 80 m, *Liesner 65* (MO, NY). COCLÉ: Penonomé, 50–1000 ft, *Williams 132* (NY, US). DARIÉN: Near Refugio, 15–21 mi N of Santa Fé, 30 m, *Duke 10258* (MO). Isla Saboga, *Duke 10368* (MO). LOS SANTOS: 10 mi S of Tonosí, *Tyson et al. 2943* (SCZ). PANAMÁ: Taboga Island, *Dwyer 3104* (MO). Punta Paitilla, *Piper 5169* (GH, US). Around Alhajuela, 30–100 m, *Pittier 2354* (GH, NY). Taboga Island, *Standley 27925* (US). Between Las Sabanas and Matías Hernández, *Standley 31919* (US).

2. **Canavalia brasiliensis** Mart. ex Benth., Ann. Wiener Mus. Naturgesch. 2: 135. 1837. TYPE: Brazil, *Martius 12798* (M, not seen).

Canavalia panamensis Piper, Contr. U.S. Natl. Herb. 20: 569. 1925. TYPE: Panama, *Piper 5168* (US, not seen).

Vine trailing or climbing on herbs and shrubs, rarely high climbing; stems terete or drying slightly angled, puberulent with ascending white hairs. *Leaves* pinnate trifoliolate, the leaflets to 15 cm long, 11 cm wide, ovate, chartaceous, apically obtuse but often with a short acuminate and sometimes mucronulate tip, basally obtuse, truncate or rounded, mostly pubescent with short scattered hairs on both sides; petiolules 3–4 mm long, ascending pubescent; petioles mostly shorter than the leaflets. *Inflorescences* axillary racemes 10–20 cm long, the flowers mostly towards the apex; bracteoles rotund, ca. 1.5 mm long; pedicels 1–1.5 mm long. *Flowers* showy, pink, white or purplish, calyx campanulate tubular, 8–12 mm long, drying with evident veins but seldom mottled, slightly oblique, the upper lip as long as the tube, entire or emarginate, deflected upwards, and the area behind compressed, the area behind this compression expanded into a small hump or bulge, the lower lip consisting of 2 round or pointed lateral teeth and 1 slightly longer, lower tooth 2–2.5 mm long, pointed and often ciliolate; standard 2.25 cm long. *Legume* woody, to 20(25) cm long and to 2.5 cm wide, oblong with a short downcurved beak, each valve with prominent sutural ribs and one additional rib 4–6 mm from the sutural rib, usually quite glabrescent; seeds ca. 12, ellipsoidal, 12–15 mm long, brown, sometimes marbled, the hilum ca. 7 mm long, forming ca. ¾ of 1 edge.

This species is often difficult, especially when dried, to distinguish from other Panamanian species. From *Canavalia glabra* and *C. oxyphylla* it is distinguished by a larger lowest calyx tooth and often by the emarginate upper calyx lip. From *C. ensiformis* it differs in its smaller seed.

Canavalia brasiliensis is one of the most widespread and common of the *Canavalia* species. It has been recorded from Florida, Mexico and Central and South America as far south as northern Argentina. It is a species of disturbed lowlands, mostly below 1,000 m. This species has occasionally been planted in some countries as a cover crop.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 253* (US, F). Water Valley, *Wedel 809* (MO, GH). CANAL ZONE: Cocolí on road to Contractors' Hill, *Dwyer 7230* (NY, US, WIS). Summit, *Johansen 1924* (US). Amador, *Piper 6707* (MO, US). Between Corozal and Ancón, 10–30 m, *Pittier 2175* (NY, US). Balboa, *Standley 25508* (US). Sosa Hill, *Standley 26481* (US). Corozal Road near Panama, *Standley 26812* (US). Balboa, *Standley 28566* (US). Farfan Beach area, *Tyson et al. 3159* (FSU, MO). Flamenco Island, Amador, *Tyson 7372* (MO). PANAMÁ: Tocumen airport, *Dwyer 4885* (MO, WIS). Near Chepo, *Hunter & Allen 97* (MO). Debajo del puente de Juan Díaz, *Lara 47* (F, PMA). Sabanas N of Panama City, *Paul 594* (US). Agricultural station, Matías Hernández, *Pittier 6896* (GH, US), *6913* (US). Bella Vista, *Standley 25348* (US). Juan Franco Race Track near Panamá, *Standley 27693* (US). Juan Díaz, *Standley 30475* (US). Punta Paitilla, *Standley 30818* (US). Between Matías Hernández and Juan Díaz, *Standley 31951* (US).

3. **Canavalia dictyota** Piper, Contr. U.S. Natl. Herb. 20: 574. 1925. TYPE: Guyana, *Jenman 4211* (US, not seen).

Twining *vine* clambering on herbs and shrubs, sometimes high climbing; stems glabrescent. *Leaves* pinnate trifoliolate, the leaflets mostly to ca. 15 cm long, 6 cm wide, ovate or elliptic, apically obtuse mostly with a short, often blunt acumen, mucronulate, basally obtuse, slightly coriaceous, sparsely pubescent or glabrate. *Inflorescence* to 25 cm long, the peduncle and rachis becoming woody in fruit; bracteoles rotund, ca. 1 mm long; pedicels 1.5–2.5 mm long. *Flowers* pink or lavender; calyx ca. 13 mm long, tubular campanulate, the upper lip large and broad, nearly as long as the tube, deeply emarginate, forming a small beak, the lower teeth obtuse, 2–3 mm long, the lowest tooth shorter than the laterals; standard 2.5–3 cm long, erect. *Legume* to 20 cm long, 3.5 cm wide, oblong with a short, apical beak and a short basal stipe; compressed, becoming woody, glabrate, longitudinally ridged at the sutures and with an additional ridge 3–5 mm from the longitudinal ridge; seeds 6–9, 17–20 mm long, compressed ovoid to ellipsoidal, mottled brown, often buoyant, the hilum extending along most of one edge.

Canavalia dictyota may be distinguished by the lowest calyx tooth which is shorter than the 2 lateral teeth. It also has narrower leaves than many other species, and the seed is often buoyant. The pod has a distinct stipe. Plants are less pubescent than most other Panamanian species.

Almost all Panamanian collections of this species are from the same locality, an open area of tropical moist forest. *Canavalia dictyota* ranges through the Antilles and northern Central America.

CANAL ZONE: BARRO COLORADO ISLAND: *Bailey & Bailey 290* (F); *Brown 53, 107* (both F); *Croat 4675* (MO, SCZ), *4794* (F, MO, NY, SCZ), *7062* (MO), *7399* (F, MO, SCZ), *7228* (F, MO, NY, SCZ, US), *7702* (MO), *12944* (MO); *Foster 1477* (MO, PMA); *Shattuck 427, 628* (both F, MO); *Wetmore & Abbe 45* (A, MO), *45A* (F, GH), *366* (A, F, MO), *381* (F); *Wilson 77* (F); *Zetek 3801* (F, MO). CANAL ZONE: Mindi, *Cowell 183* (NY). Frijoles, *Croat 9051, 12607* (both MO), *13224* (F, MO). Miraflores, *White & White 63* (MO, US).

4. **Canavalia ensiformis** (L.) DC., Prodr. 2: 404. 1825.

Phaseolus maximus, siliqua ensiformis . . . . Sloane, Cat. Pl. Jamaica 1: 68. 1696. LECTOTYPE (fide Sauer) Sloane, Cat. Pl. Jamaica 1, *tab. 114. figs. 1–3.*
Dolichos ensiformis L., Sp. Pl. 2: 725. 1753. Based on *Phaseolus maximus, siliqua ensiformis* . . . . Sloane.

Vine, stems glabrescent. *Leaves* pinnate trifoliolate, leaflets to 20 cm long, broadly ovate, apically obtuse with a blunt apiculum, glabrate. *Inflorescence*

slender in flower, to 30 cm long; bracteoles obtuse, ca. 2 mm long; pedicels ca. 2 mm long. *Flowers* lavender; calyx tubular, ca. 14 mm long, sparingly pubescent, the upper lip about equalling the tube, emarginate, the lowest tooth slender, ca. 2.5 mm long, longer than the ovate lateral teeth; standard 2.75 cm long. *Legume* to 30 cm long, 3.5 cm thick, woody, oblong with a short apical beak and short basal stipe, explosively dehiscent, the valves glabrescent, each with a sutural rib and an additional rib ca. 5 mm from the sutural rib; seeds ca. 29 mm long, oblong, compressed, white or ivory, the hilum ca. 9 mm long, about ½ as long as the seed.

Canavalia ensiformis may be distinguished by its white seeds, which are not buoyant. The lowest calyx tooth is longer and narrower than any other Panamanian species except *C. villosa*. *Canavalia ensiformis* is also recognizable by its narrow calyx tube.

This species is cultivated from time to time for soil binding or fodder, and the plants collected in Panama may have been cultivated. Sauer (1964) indicated that this species was domesticated by pre-Colombian Indians and that current records of the plant all come from cultivation. The plants were cultivated as an annual crop, although plants may live longer than one year. In South America, the seeds and shoots are eaten.

CANAL ZONE: Vine on trellis at barracks, Fort Clayton, *Greenman & Greenman 5188* (MO).

5. **Canavalia glabra** (Mart. & Gal.) Sauer, Brittonia 16: 130. 1964.

Wenderothia glabra Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 10: 192. 1843. TYPE: Mexico, *Galeotti 3307* (P, not seen).

Canavalia villosa Benth. var. *glabra* (Mart. & Gal.) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 160. 1936.

C. munda Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 10. 1943. TYPE: Guatemala, *Steyermark 33179* (F, not seen).

Vine trailing or climbing on herbs and shrubs; stems glabrate, sometimes with sparse erect brownish hairs. *Leaves* pinnate trifoliolate, leaflets mostly 10–14 cm long, 4–7 cm wide, ovate, apically acuminate, acute or obtuse with a short acumen, sparsely pubescent with weak white hairs. *Inflorescence* to 20 cm long; bracteoles rotund, ca. 2 mm long; pedicels ca. 3 mm long. *Flowers* white or rose; calyx ca. 13 mm long, pubescent with short, dense hairs, the tube relatively long, the upper lip as long as the tube, forming a short umbo, the top of the calyx with a distinct hump behind the recessed area behind the lip, the lowest tooth ca. 2.5 mm long, pointed, exceeding the obtuse lateral teeth; standard ca. 4 cm long. *Legumes* to ca. 20 cm long, 3 cm wide, oblong with a pronounced beak and a short narrow stipe, compressed, glabrescent, with prominent longitudinal ridges at the sutures and each valve with an additional ridge near the sutural ridge; seeds to 15 mm long, oblong, compressed, the hilum ca. 7 mm long.

Canavalia glabra may be recognized by the hump on the top of the calyx and by the relatively long lowest calyx tooth. In spite of its epithet, the species is more pubescent than some other species in Panama.

This species ranges from southern Mexico to Peru, but it is more common in northern Central America.

HERRERA: Chitré, 20 m, *Allen 1108* (MO). LOS SANTOS: Headwaters of Río Pedregal 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2956* (MO, SCZ).

6. **Canavalia gladiata** (Jacq.) DC.,[20] Prodr. 2: 404. 1825.

Dolichos gladiatus Jacq., Collect. Bot. 2: 276, *tab. 215*, 1788. LECTOTYPE: Jacquin's plate (design. Sauer 1964).

Twining climbing *vines*; stems terete, glabrate, with a few minute retrorse weak hairs. *Leaves* pinnate trifoliolate; leaflets ovate, mostly ca. 10 cm long, ca. 6 cm wide; apically acute or short acuminate, basally rounded or obtuse, chartaceous, glabrate, the surface with scattered minute hairs. *Inflorescence* axillary, ca. 10 mm long; bracteoles caducous; pedicels ca. 1 mm long or obsolete, rachis with swollen glandular nodes. *Flowers* lavender; calyx tubular, 10–15 mm long, glabrate, the upper lip elongate, emarginate, the lowest tooth ca. 1.5 mm long, pointed, slightly exceeding the lateral teeth, puberulent; standard 2.5–3 cm long. *Legume* 24–30 cm long, ca. 5 cm wide, oblong, compressed, the beak slightly downturned, longitudinally ridged on the sutures and with an additional ridge 4–6 mm from the sutural ridges, glabrate or with minute, inconspicuous scattered white hairs; seeds dark red or pink, oblong ovate or elliptical, 3–4 cm long, ca. 2 mm wide, compressed, the hilum ca. 2 cm long, dark, ¾ the length of one edge of the seed.

This species may be distinguished by its very large pods and large pink or red seeds.

Canavalia gladiata is commonly cultivated in tropical regions of the Old World. The pods are cooked green and the seeds are also eaten. Sauer (1964) reports that it is unknown except in association with cultivation. The species is rarely cultivated in the New World. The single Panamanian record is of a plant cultivated as an ornamental patio climber. The large pods and unusual seeds render it a horticultural curiosity.

PANAMÁ: San Francisco de la Caleta, seeds obtained from Camino de la Pintada at Santa María, Coclé Province, *Arosemena* 26 Oct. 1979 (PMA).

7. **Canavalia maritima** (Aubl.) Thouars,[21] J. Bot. (Desvaux) 1: 80. 1813 '*Canavali*'.—FIG. 9.

Dolichos maritimus Aubl., Hist. Pl. Guiane Fr. 765. 1775. LECTOTYPE: (Sauer 1964) illustration of *Phaseolus maritimus purgans* . . . . Pluk., Phytogr. *tab. 51, fig. 2*. 1691.
Dolichos maritimus repens . . . . P. Br., Civ. & Nat. Hist. Jam. 293. 1761. Based on *Phaseolus maritimus purgans* . . . . Pluk.
D. roseus Swartz, Prod. Veg. Ind. Occ. 105. 1788. Based on *Dolichos maritimus* . . . . Browne.
Canavalia rosea (Swartz) DC., Prodr. 2: 404. 1825.

Prostrate *vine*, occasionally climbing; stems sparsely puberulent with short white hairs, glabrescent, sometimes stout. *Leaves* pinnate trifoliolate, the leaflets mostly ca. 10 cm long, 10 cm broad, broadly obovate, ovate or orbicular, apically rounded or emarginate, occasionally short acuminate, mucronulate, coriaceous,

[20] For a list of synonyms see Sauer, 1964. All synonyms listed by Sauer relate to Old World Plants and only the names noted here relate directly to Panamanian plants.
[21] For further synonyms see Sauer, 1964. Only these names relate directly to Panamanian plants.

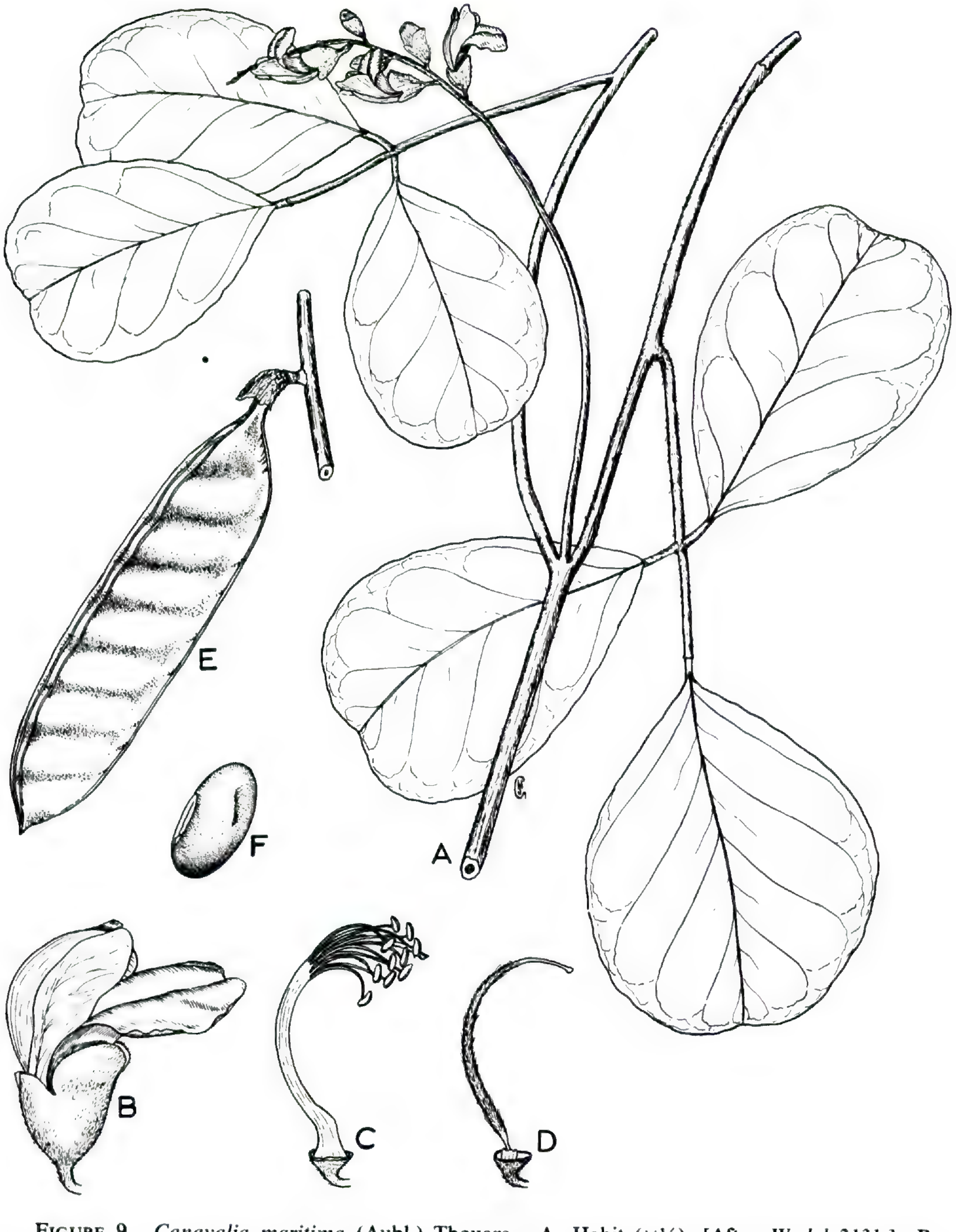

FIGURE 9. *Canavalia maritima* (Aubl.) Thouars.—A. Habit (×½). [After *Wedel 2131.*]—B. Flower (×1½).—C. Stamens (×1½).—D. Pistil (×1½). [After *Wedel 2835.*]—E. Fruit (×½).—F. Seed (×1). [After *Tracy 184.*]

sparsely puberulent with short white hairs on both sides, more so beneath; petiolules 5–9 mm long. *Inflorescence* axillary, to 30 cm long, prostrate but ascending at the tip; bracteoles often paired, obtuse, 1–1.5 mm long; pedicels 2–4 mm long. *Flowers* pale rose or blue; calyx tubular, 10–12 mm long, the upper lip

emarginate, short, not umbonate, the lowest tooth ca. 2 mm long, slightly exceeding the lateral teeth, moderately pubescent; standard ca. 3 cm long. *Legume* mostly 9–15 cm long, ca. 2.5 cm thick, oblong, minutely puberulent, longitudinally ridged at the sutures and each valve with 1 additional ridge 3–5 mm from the suture; seeds ca. 14 mm long, ovoid, brown, the hilum short, ca. 7 mm long; buoyant.

Canavalia maritima is distinct in its broad, apically rounded or emarginate leaflets, in its often longer petiolules and pedicels, and in the relatively short upper lip of the calyx.

This species is mostly restricted to sea beaches, where it is a pioneer on the sand along with *Ipomoea pes-caprae*. At the edges of beaches it sometimes climbs on rocks or thickets. *Canavalia maritima* is common to tropical and subtropical seacoasts in both hemispheres.

BOCAS DEL TORO: Isla Colón, *Wedel 449* (MO). Old Bank Island, *Wedel 2131* (MO). Isla Colón, *Wedel 2835* (MO). CANAL ZONE: Farfan area, Ft. Kobbe, *D'Arcy 9632* (MO); *Duke 4208* (MO). E of Gatún Locks, *Duke 4320* (MO). Farfan Beach, *Dwyer 6768* (MO). Chagres, *Fendler 80* (MO). Farfan Beach, *Lewis et al. 307* (MO). Balboa, *Mell 4* (NY). Fort Sherman, *Porter et al. 4982* (MO); *Tyson 2253* (MO). First island out Amador causeway, *Tyson & Lazor 6148* (PMA); *Tyson 7372* (PMA), *7382* (MO, PMA). CHIRIQUÍ: Guanaban, 2–4 km S of Puerto Armuelles, *Busey 499* (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 508* (MO). COLÓN: Río Piedras on road to Portobelo, *Blum et al. 2526* (MO). San Miguel de la Borda, *Croat 9862* (MO, NY, PMA). María Chiquita, *Dwyer 4467* (MO); *Taylor 113* (PMAO). LOS SANTOS: Monagre Beach, *Dwyer 4136* (MO). PANAMÁ: San Carlos, *Allen 1141* (MO). Punta Chame near S tip, *D'Arcy 10223* (MO). Isla Tobaguilla, *Duke 5875* (MO). Isla del Rey, *Duke 9550* (MO). Isla de Pedro Gonzales, Perlas Archipelago, *Dwyer 1715* (MO). Playa Coronado, *Gentry 2899* (MO). San Jose Island, *Harlow 98* (US); *Kennedy 2283* (MO). Bella Vista, *Killip 12008* (NY). Playa Coronado, *Koster 175* (MO). PANAMÁ: Vera Cruz, *Lewis et al. 2993* (MO, SCZ). Moro Island, *Mori et al. 4080* (WIS). Playa Farallón, Río Hato, *Taylor 112* (PMA). San Jose Island, *Tyson & Loftin 5051* (MO, SCZ). SAN BLAS: Naraganá Island, *Croat 16848* (MO). Isla Soskatupu, *Duke 8932* (MO). Isla Ustupo, *Gentry 6336* (MO).

8. **Canavalia oxyphylla** Standley & L. O. Williams, Ceiba 3: 201. 1953. TYPE: Honduras, *Allen 6458*, not seen.

Vine twining on shrubs and high climbing; stems glabrate. *Leaves* pinnate trifoliolate, leaflets mostly 10–12 cm long, 5–7 cm wide, ovate, apically acuminate, chartaceous, sparingly pubescent on both sides; petiolules 4–6 mm long. *Inflorescences* axillary, mostly 10–18 cm long; bracteoles obtuse or deltoid, 1–1.5 mm long; pedicels 1–1.5 mm long. *Flowers* white, pink or lavender; calyx 10–14 mm long, often drying mottled, tubular campanulate, the upper lip short, forming a distinct umbo, the lower teeth membranaceous, the lowest acute, 1.75–2 mm long, exceeding the obtuse lateral teeth; standard ca. 4 cm long. *Legume* oblong, the apical beak short, the basal stipe terete, stout, 1.5–2 cm long, woody, glabrescent, each valve with sutural ridges and 1 additional ridge situated more than 7 mm from the suture and hence often appearing medial on the valve; seeds compressed ovoid, ca. 17 mm long, tan colored, the hilum forming half the circumference.

This species is distinct in its pod which in addition to the sutural ridges has one longitudinal ridge appearing almost medially on the valves, and which has a stout, terete stipe 1–2 cm long. The seeds are quite flat, and the hilum is longer than on other Panamanian species. The lower calyx teeth are membranaceous

and conspicuously pubescent and the lowest is acute. The short upper lip forms a distinct umbo. In spite of these differences, the species is often difficult to distinguish in the herbarium from *C. brasiliensis* and *C. bicarinata*.

Canavalia oxyphylla ranges from southern Mexico to northern South America.

BOCAS DEL TORO: Santa Catalina, *Blackwell et al. 2712* (MO). Water Valley, *Wedel 1595* (MO, GH, MO), *1803* (US), *1820* (GH, MO), *1846* (MO, GH). CANAL ZONE: Farfan beach area, *Tyson et al. 3161* (SCZ). CHIRIQUÍ: Monte Verde 2.5 mi W of Puerto Armuelles, 80 m, *Liesner 57* (GH). Above San Félix, road to Cerro Colorado, 800–1000 m, *Croat 33163* (MO). COCLÉ: El Valle, *Croat 13313* (MO, NY, SCZ); *Lewis et al. 2533* (MO, SCZ). COLÓN: 4 km NW of Salamanca, 13 km NE of Buenos Aires, 340–410 m, *Nee 9077* (MO, US). PANAMÁ: Capira along trail between Ledice and Aguacate, 300 m, *Foster 2147* (MO, PMA). Campo Experimental de Monte Oscuro, 12 km de Capira, 10 m, *Correa 1932* (PMA). VERAGUAS: Between Cañazas and foot of Cordillera Central, headwaters of Río Cañazas, 300–600 m, *Allen 197* (MO, US). Hills W of Soná, 500 m, *Allen 1032* (GH, MO, US).

9. **Canavalia villosa** Benth.,[22] Ann. Wiener Mus. Naturgesch. 2: 135. 1837. TYPE: Mexico, *Karwinsky M12819* (M, not seen).

Twining *vine* climbing on shrubs and trees, stems mostly puberulent with curved brownish hairs. *Leaves* pinnate trifoliolate; leaflets mostly 10–12 cm long, 5–8 cm wide, ovate or obovate, the lateral leaflets oblique, apically acuminate, basally obtuse or rounded, drying discolorous, pubescent along the veins and margin on both sides, mostly copiously pubescent on the lamina, especially beneath; petiolules and petioles mostly densely pubescent. *Inflorescence* mostly 12–20 cm long; bracteoles ca. 2 mm long, often wider, pointed or rounded, mostly tomentose; pedicels obsolete or to 3 mm long. *Flowers* blue, purplish, or pink; calyx 17–20 mm long, often drying mottled, campanulate, the upper lip as long as or longer than the tube, prominently umbonate or not, sometimes slightly emarginate, glabrate to tomentose, the lowest tooth narrow, 2.5–4.5 mm long, longer than the deltoid lateral teeth; standard ca. 3.5 cm long, often drying brownish and striate. *Legume* mostly 14–17 cm long, ca. 2.5 cm wide, oblong, sometimes slightly expanded apically, the beak short and hardly downturned, stipe evident or not, longitudinally ridged at the sutures and with 1 additional ridge 5–10 mm from the sutures, long shaggy pilose when immature, at maturity evenly pilose with soft erect hairs; seeds 12–17 mm long, elliptical discoid, light brown, mottled, the hilum short, 6–7 mm long.

Canavalia villosa is distinct in a number of features; long calyx, long and narrow lowest calyx tooth, elongate upper calyx lip, narrow pointed bracteoles, and usually in its general overall pubescence.

This species ranges from northern Mexico to Panama and has been occasionally collected in South America. In Panama most collections have been made in upland areas.

CHIRIQUÍ: El Barú above Boquete, 1200–1800 m, *D'Arcy 9932, 9934* (both MO). Lava flow between El Hato and Bambito, *D'Arcy 10034* (MO). Lava fields near town of Volcán, *Duke 9138* (MO, NY). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 325* (MO, GH, US), *603* (GH, NY, US). 2.5 km W of Puerto Armuelles, 80 m, *Liesner 57* (MO). San Félix 0–120 m, *Pittier 5298* (GH, NY, US). Boquete, 3800 ft, *Terry 1282* (A, F, MO, US). Baja Mono, 4000 ft, *Terry & Terry 1648a* (F). Lava flow 4 mi above Volcán, *Tyson 7285* (PMA). COCLÉ: El Valle de Antón, 1000–2000 ft,

[22] Several synonyms for this species are given by Sauer, 1964. Only this name has been used for Panamanian plants.

Lewis et al. 2612 (MO, SCZ). HERRERA: 4 mi S of Los Pozos, *Tyson 2678* (MO). LOS SANTOS: 11 mi N of Tonosí, *Tyson 2966* (SCZ). 12 mi S of Macaracas, *Tyson et al. 3077* (MO, FSU). PANAMÁ: Debajo del puente de Juan Díaz, *Lara 47* (F). VERAGUAS: Quebrada just S of Santa Fé, 450 m, *Nee 8045* (MO).

10. CENTROSEMA

W. G. D'Arcy[23]

Centrosema (DC.) Benth., Comm. Legum. Gen. 53. 1837; Ann. Wiener Mus. Naturgesch. 2: 117. 1840 (1839). TYPE: *C. brasiliana* (L.) Benth. nomen cons. vs. *Steganotropis* Lehm.

Bradburya Raf., Fl. Ludov. 104. 1817. TYPE: *B. scandens* Raf. = *Centrosema virginiana* (L.) Kuntze. Nomen rejic. vs. *Bradburia* Torr. & Gray (1842). Compositae.

Cruminium Desvaux, Ann. Sci. Nat. (Paris) sér. 1. 9: 423, Sept. 1826. TYPE: *C. giganteum* Desv. = *Centrosema plumieri* (Pers.) Benth.

Steganotropis Lehm. I. Sem. Hort. Bot. Hamburg 1826: 18. 1826; Linnaea 3 (Litt.): 11. 1828. TYPE: *S. conjugata* J. C. C. Lehmann. Nomen rejic. vs. *Centrosema* (DC.) Benth.

Clitoria sect. III *Centrosema* DC., Prodr. 2: 234. 1825.

Mostly twining *vines*, trailing, or sometimes high climbing, stems often wiry, puberulent. *Leaves* imparipinnate 1–5-foliolate, but mostly 3-foliolate, the leaflets narrow or broad; petiolules mostly short, drying wrinkled; petioles sometimes winged; stipels equalling or exceeding the petiolules (Panama); stipules prominently nervate. *Inflorescences* several flowered congested racemes, usually only one flower opening at a time; bracts and bracteoles nervate, the bracts often spathaceous or calyx-like, enfolding the bud. *Flowers* showy, the standard flat, discoid, often emarginate, with a distinct notch or spur near the base, mostly puberulent outside, the keel and wings directed upwards, curved; stamens diadelphous, the vexillary stamen free or nearly so, ovary linear, sessile, pubescent, the style incurved, sometimes persistent as an elongate beak, glabrous except basally, apically expanded into a blade, the stigma marginal on the style apex, minutely pubescent. *Legume* linear, dehiscent along the 2 valves, often spiralling, the sutures prominent, the apex sometimes long-beaked; seeds plump, ellipsoidal, numerous, the hilum linear along one edge.

Centrosema is a New World genus of perhaps 35 species ranging from the southern United States into Argentina and throughout the Antilles.

The genus is distinct in the notch or spur on the standard and in the flat, linear beaked pods. The striate bracts and stipules, and stipels as long as the petiolules are useful recognition features for the Panamanian species.

Centrosema virginiana (L.) Kuntze, widely dispersed in tropical America, has not been collected in Panama. Similar to *C. pubescens*, it has 5 subequal subulate calyx teeth and the pod is less than 4 mm wide.

Literature:

Barbosa-Fevereiro, V. P. 1977. *Centrosema* (A. P. de Candolle) Bentham do Brasil—Leguminosae—Faboideae. Rodriguezia 29: 159–219.

Fantz, P. R. 1979. A new species of *Centrosema* (Leguminosae) from Nicaragua and a key to the species in Central America. Sida 8: 152–156.

[23] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

a. Leaves unifoliolate (simple); petioles conspicuously winged ---------- 6. *C. sagittata*
aa. Leaves trifoliolate; petioles unwinged.
b. Leaves mostly linear, less than 8 mm wide; pod less than 4 mm wide.
c. Leaves with secondary venation at right angles to the midrib; flowers more than 2 cm long; stipules less than 5 mm long ---------- 1. *C. angustifolia*
cc. Leaves with secondary venation ascending; flowers less than 1.5 cm long; stipules more than 5 mm long ---------- 3. *C. pascuora*
bb. Leaves ovate or elliptical, more than 10 mm long; pod more than 4 mm wide.
d. Bracts large, persistent 1–3 cm long, 8–15 mm wide; persistent stipules large ---------- 7. *C. vexillata*
dd. Bracts smaller, caducous or persistent, less than 1 cm long, narrow, less than 8 mm wide; stipules smaller, 8–11 mm long.
e. Bracts caducous; bracteoles calyx and pod drying dark; seeds 6–9 mm across; calyx lobes undulate; flowers pink and red ---------- 4. *C. plumieri*
ee. Bracts persistent; bracteoles calyx and pod drying green or brown; seeds less than 6 mm long; calyx lobes pointed; flowers purple, blue or violet.
f. Pod more than 7 mm wide, the margins ca. 1 mm wide; stipels 4–5 mm long; leaves glabrate above, mostly 8–13 cm long, narrowly ovate; petiolules 3–5 mm long ---------- 2. *C. macrocarpa*
ff. Pod mostly less than 7 mm wide, the margins less than 1 mm wide; stipels 1–2 mm long; leaves pubescent above, mostly 4–8 cm long, broadly ovate, petiolules 1–3 mm long ---------- 5. *C. pubescens*

1. **Centrosema angustifolia** (H.B.K.) Benth., Comm. Legum. Gen. 54. 1837.—FIG. 10.

Clitoria angustifolia H.B.K., Nov. Gen. Sp. Pl. 6: 417. 1824. TYPE: Venezuela, not seen.

Slender twining *vines*; stems wiry, minutely pubescent with erect white hairs. *Leaves* pinnate trifoliolate; leaflets narrowly linear oblong, mostly 3–5 cm long, 5–9 mm wide, gradually long tapering to a blunt tip, basally rounded and minutely cordate, the costa conspicuous, lateral veins ca. 20–30 arising at right angles to the costa, anastomosing irregularly near the margin, shiny and glabrate above but with scattered minute reduced trichomes and a small tuft at the base, glabrous beneath, slightly revolute; petioles 1–1.5 mm long, drying wrinkled with a few hairs; rachis ca. 2 mm long, ridged or channelled dorsally; petioles mostly shorter than the terminal leaflet, sparingly pubescent with erect elongate hairs; stipels subulate, glabrous, exceeding the rachis; stipules narrowly deltoid, ca. 4 mm long, conspicuously striate. *Inflorescence* a few flowered congested raceme, only 1 flower opening at a time; peduncle slender, glabrate, 1–20 cm long; bracts spathaceous, strongly nervate, 10–15 mm long, the inner bract pointed; pedicels obscure. *Flowers* showy, purple, calyx cupular, 10 mm long, the sinuses rounded, the lobes deltoid, but the lowest lobe elongate, subulate, ca. 8 mm long, standard orbicular, flat, minutely emarginate, 2.5–3 cm across. *Legume* linear, 7–10 cm long including the acicular, 10–15 mm long beak, 3–4 mm wide, glabrous; seeds dark brown, discoid, ca. 2 mm long.

Centrosema angustifolia may be recognized by its smaller, narrower, subcoriaceous leaves with venation diverging at right angles from the costa, and by the seeds which are only about 2 mm long.

This species ranges from Central America to northern South America.

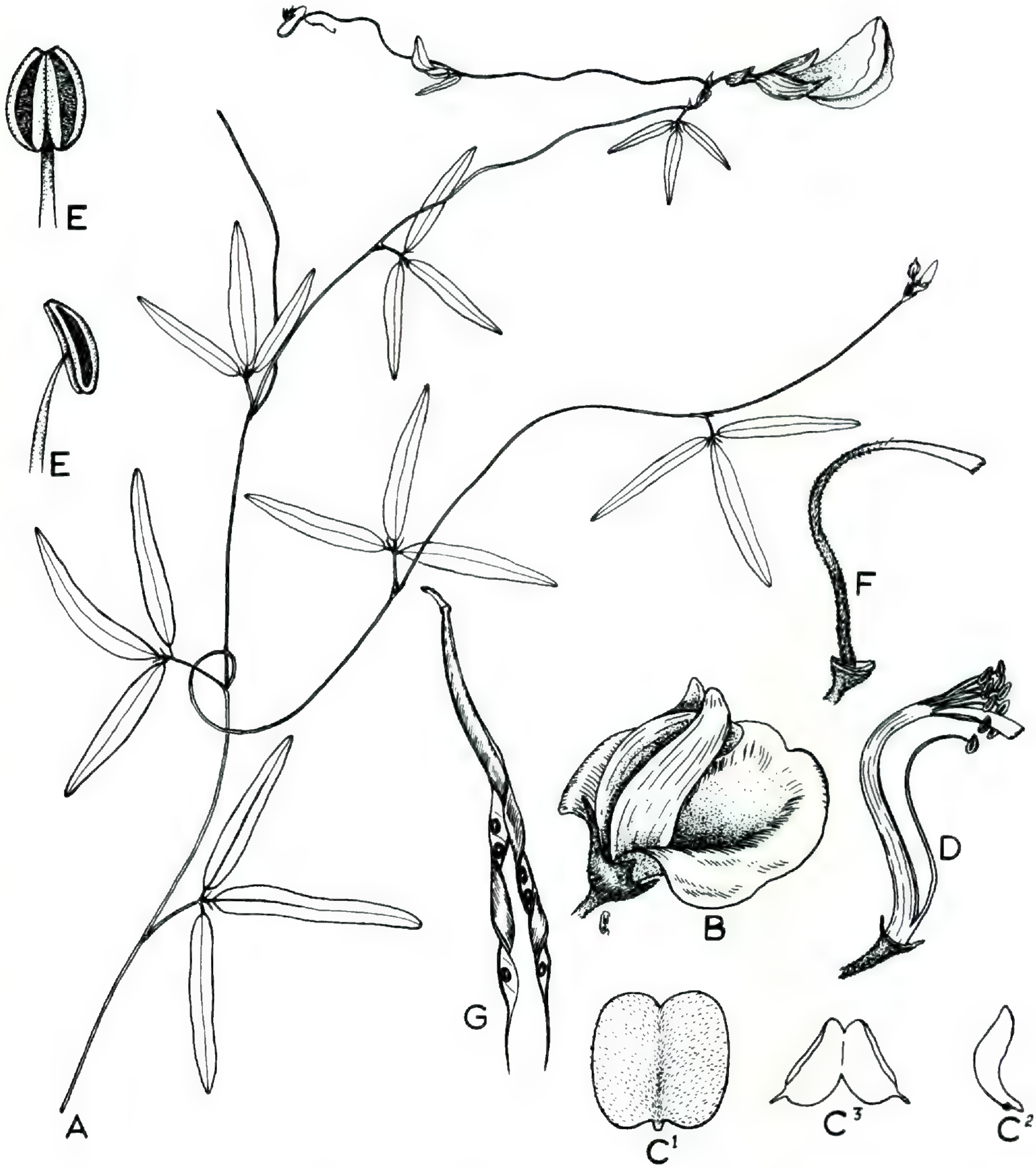

FIGURE 10. *Centrosema angustifolia* (H.B.K.) Benth.—A. Habit (×½). [After *Hunter & Allen 37.*]—B. Flower (×1).—C. Corolla.—C¹. Standard (×½).—C². Wing petal (×½).—C³. Keel petals (×½).—D. Stamens (×2).—E. Anthers.—F. Pistil (×2). [After *Dodge et al. 16679.*]—G. Fruit with seeds (×½). [After *Dodge et al. 16679A.*]

CANAL ZONE: Government forest along Las Cruces Trail, 75 m, *Hunter & Allen 707* (MO). Ancón Hill, *Greenman & Greenman 5126* (MO); *Piper 5148; Standley 25182* (US); *26344* (MO, US). CHIRIQUÍ: Sabana de Marcelito near El Vigia, *Pittier 2380* (US). COCLÉ: Natá, 50 m, *Allen 814* (MO). HERRERA: to 8 mi SW of Las Minas, *D'Arcy 13541* (MO). PANAMÁ: Pacora, 35 m, *Allen 995* (MO). Road between Panamá and Chepo, *Dodge et al. 16679* (GH, MO). Cerro Campana, *Duke 5960* (MO). Savanas near Chepo, *Duke 6054* (MO). Las Sabanas, *Heriberto 142* (GH, US). Savanas near Chepo, *Hunter & Allen 37* (MO). Juan Díaz, *Killip 3162* (US). Taboga Island, *Miller 2023* (US). Laguna de Portala near Chepo, 50 m, *Pittier 4599* (US). Sabana de Dormisolo near Chepo, *Pittier 4650* (US). Big Swamp E of Río Tocumen, *Standley 26539* (US). Tumba Muerta Road near Panamá, *Standley 29748* (US).

2. **Centrosema macrocarpa** Benth., Ann. Nat. Hist. (Paris) ser. 1. 3: 436. 1839. TYPE: Guiana, *Schomburgk* (K, not seen).

Centrosema lisboae Ducke, Notizbl. Königl. Bot. Gart. Berlin 11: 548. 1932. TYPE: Brazil, *Ducke 2309* (G, not seen; photo MO).

Robust *vine*, stems terete, becoming somewhat woody, pilose with tan colored hairs, glabrescent. *Leaves* pinnate trifoliolate, the leaflets narrowly ovate, apically acute or slightly acuminate, mostly 8–13 cm long, 3–8 cm wide, basally rounded, papyraceous to subcoriaceous, glabrate on both sides or pubescent beneath; petiolules 3–5 mm long, stout; rachis and petioles drying grooved, pubescent; stipels linear subulate, about as long as the petiolules; stipules acute, nervate, 4–5 mm long. *Inflorescences* few flowered pseudoracemes, peduncles 2–6 cm long, the rachis thickened with conspicuous nodes, 2–3 cm long; bracts stipule-like; bracteoles ovate subspathaceous, ca. 10 mm long, ciliolate, glabrate, finely nervate, enclosing the calyx cup but not the longest tooth; pedicels 3–7 mm long, puberulent. *Flowers* pink and red within, green and pink outside; calyx cupular, the cup 3–4 mm long, the teeth dorsally pubescent, the longest 7–10 mm long, the others 4–5 mm long, the lower pair united about halfway up, the sinus acute; standard orbicular, ca. 3 mm long, puberulent dorsally. *Fruit* linear, mostly 15–20 cm long, 7–8 mm wide, compressed, smooth, the margins conspicuously thickened, ca. 2 mm wide, the beak 10–13 mm long, acicular, straight, glabrous; seeds dark brown, rectangular, 5–6 mm long, the hilum occupying one side.

This species is distinct in its narrow, pointed leaves with small stipels and its large pod. The vine is sturdier with stouter stems than most other Panamanian species of *Centrosema*.

Centrosema macrocarpa is widespread in tropical South America ranging as far as Sao Paulo, Brazil, and Panama. In Panama it has been collected in the Canal Zone and in Bocas del Toro.

BOCAS DEL TORO: Quebrada Huron, *Kirkbride & Duke 454* (MO). CANAL ZONE: Near water reservoir W of Cocoli, *Croat 9163* (MO). Road C21 near Police Lodge, *Croat 12987* (MO). K-9 Road, *Dwyer 3017* (MO). ½ km W of Summit Gardens, *Nee 9492* (MO).

3. **Centrosema pascuora** (Mart. ex Benth., Comm. Legum. Gen. 56. 1837. TYPE: Brazil, *Martius*, not seen.

Delicate *vine* or erect *herb*; stems slender, sparingly long pilose with spreading white hairs, glabrescent, sometimes reddish, a fine tomentum of minute hairs sometimes persistent near the base of the plant. *Leaves* trifoliolate, the leaflets linear, narrowly ovate, or oblong, mostly gradually tapering to the apex; apically mucronate, basally abruptly obtuse, mostly 4–10 cm long, 4–7 mm wide, glabrate, the major pinnate veins ascending, arcuate and anastomosing near the margin to form a submarginal vein, the minor venation reticulate, elevated; petiolules ca. 2 mm long with a few elongate white hairs; petioles mostly 2–4 cm long, glabrate, slender, drying angled; stipels subulate, 3–6 mm long; stipules ca. 7 mm long, acuminate deltoid, sometimes slightly reddish, strongly nervate. *Inflorescences* 1 or 2 peduncles per leaf axil, each peduncle 1 flowered but with an undeveloped flower at the apex; peduncles 5–10 mm long, sparingly pilose; bracts ca. 8 mm

long, ciliate, resembling the stipules but narrower; bracteoles resembling the bracts but broader, covering most of the calyx; pedicels about as long as the peduncles, glabrous. *Flowers* blue, standard ca. 2 cm long, calyx short cupular, the teeth subulate, the uppermost longest, ca. 7 mm long, the others ca. 5 mm long, the sinus between the lowest 2 shorter; standard orbicular, flat, ca. 2 cm long. *Legume* linear, slightly curved, compressed, mostly 4–8 cm long, 3–4 mm wide, the margins thickened, the beak acicular, to 10 mm long, sparingly pilose; seeds compressed rectangular, ca. 4 mm long, brown.

This species is superficially similar to *Centrosema angustifolia,* but the venation of the leaves is ascending rather than at right angles to the costa; the flowers are smaller and the seeds are larger.

Centrosema pascuora ranges from Panama to Ecuador and Brazil. In Panama it has been collected near the Pacific coast.

COCLÉ: Río Hato airstrip, *Burch et al. 1132* (GH, MO, US). PANAMÁ: Río Mar, *Tyson et al. 2303* (FSU, NY, SCZ).

4. **Centrosema plumieri** (Pers.) Benth., Comm. Legum. Gen. 54. 1837.

Clitoria plumieri Pers., Syn. Pl. 2: 303. 1807. Based on *Phaseolus ampla flore* . . . . Plumier. Descr. Pl. Amer. 5: 108. 1713 [1693]. TYPE: Plumier's illustration, based on a Plumier collection from Port-de-Paix, Hispaniola.

Robust twining *vine*; stems pubescent just above the nodes, otherwise often glabrate. *Leaves* pinnate trifoliolate, leaflets broadly ovate to rhombic 5–9(–15) cm long, sharply short acuminate, basally obtuse or cuneiform, shiny and glabrate above except on the midvein, copiously appressed pubescent beneath with straight white hairs; petiolules 3–4 mm long, drying dark, glabrate except tomentose ventrally; rachis and petiole drying with a conspicuous dorsal groove near the ends, glabrate to pilose; rachis 10–25 mm long, petiole mostly shorter than the terminal leaflet; stipels subulate, exceeding the petiolules, stipules obtuse, ca. 5 mm long, conspicuously striate, ciliolate. *Inflorescence* axillary, few flowered; peduncles stiff, drying dark, 2–10 cm long; bracts caducous; bracteoles 2, inserted at the top of the pedicel, spathaceous, 10–20 mm long, conspicuously nervate, apically ciliolate, often drying dark; pedicels 6–10 mm long. *Flowers* showy; calyx cupular, 4–6 mm long, the teeth undulate except for the slightly longer lowest tooth, glabrate; standard orbicular, emarginate, nearly flat, 5–6 cm across, white outside, purple inside, pubescent outside, wings and keel purple. *Legume* linear, flat, 10–14 cm long, ca. 10 mm wide, thick margined, mostly drying black, glabrate; seeds ellipsoidal, rhomboidal, 6–9 mm long, dark brown, the hilum along one corner.

This species is distinct in its broad, sharp pointed leaves and in its large showy flowers which are contrasting white and purple. The pod is larger than other Panamanian species of *Centrosema,* and the margins are much broader. The appressed pubescence of the leaf undersides is also distinctive when present.

Centrosema plumieri ranges throughout tropical America and is introduced to the Old World. In Panama it occurs mainly in moist forest areas.

BOCAS DEL TORO: Río Teribe just below Puerto Palenque, *Kirkbride & Duke 547* (MO). Almirante, *Sharp* 11 Nov. 62 (SCZ). Water Valley, *Wedel 1629* (GH, MO, US), *1753* (GH, US). CANAL ZONE: Tabernilla, *Cowell 269* (NY). Road to Contractors' Hill, *Dwyer 4004* (MO). Cocoli, *Dwyer 7203* (GH, MO), *7218* (GH). Gamboa, *Greenman & Greenman 5166* (MO). Observatory on Gamboa Road, *Hladik 235* (MO). Pedro Miguel, *Killip 3346* (US). Summit, *Lindsay 413* (MO). Chiva Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5178* (US). Between Miraflores and Corozal, *Pittier 2194* (NY, US). Gamboa, *Pittier 6517* (GH, NY, US). Old Las Cruces trail between Fort Clayton and Corozal, *Standley 29006* (US). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 555* (GH, MO). 1–5 mi S of Antón on road to coast, *Tyson & Blum 2577* (FSU, MO, SCZ). DARIÉN: Santa Fé, *Duke 9480* (MO, US). LOS SANTOS: Playa de Concepción, *Burch et al. 1268* (GH, MO, US). Between Tonosí and Macaracas, *Oliver et al. 3553* (MO). 12 mi S of Macaracas, *Tyson et al. 2935* (FSU, MO, SCZ). PANAMÁ: Sea beach from Panama Viejo to Bella Vista, *Allen 829* (F, GH, MO). Without other locality, *Kennedy 2014* (F). Matías Hernández, *Pittier 6884, 6897* (both US). Juan Díaz, *Standley 30473* (US). Between Matías Hernández and Juan Díaz, *Standley 31934* (US). SAN BLAS: Río Cartí, *Kennedy et al. 2014* (MO); *Perrin 1967* (MO). Between Río Pialla and Río Ailigandí, *Warner 190* (MO).

5. **Centrosema pubescens** Benth., Ann. Wiener Mus. Naturgesch. 2: 119. 1837. TYPE: Mexico, *Keerle*, Herb. Martius (?M, not seen).

Bradburya pubescens (Benth.) Kuntze, Rev. Gen. 1: 164. 1891.

Twining *vine* scrambling on herbs and shrubs, stems slender, often wiry, puberulent to pilose. *Leaves* pinnate trifoliolate; leaflets ovate, apically obtuse or acute, mucronulate, basally obtuse or rounded, mostly 4–8 cm long, 1.5–3.5 cm wide, the terminal leaflet largest, pubescent with short weak erect hairs, more so beneath; petiolules tomentose, 1–3 mm long; petioles shorter than the terminal leaflet; stipels subulate, 1–2 mm long; stipules deltoid acuminate, drying striate, 1–2 mm long. *Inflorescences* axillary, congested several flowered racemes; peduncle 2–5 cm long, bracts narrow, nervate, caducous; bracteoles 2, spathaceous, 5–8 mm long, conspicuously nervate, enveloping the lower calyx teeth; pedicels ca. 5 mm long, glabrate. *Flowers* showy, blue or violet, almost white; calyx cupular, the lower tooth mostly subulate, often pubescent, 2–3 times as long as the others, the other teeth deltoid, 2–3 mm long, glabrate; standard 3–5 cm broad, orbicular, nearly flat, emarginate, puberulent outside, with fine dark lines and often with a purplish spot. *Legume* linear oblong, greatly compressed, 6–7 mm across, the margins thickened, mostly straight, 5–7 cm long, the beak prominent, slender, 0.5–1.5 cm long; seeds 15–30, compressed rectangular, dark brown, mottled, ca. 3 mm long.

This species is distinct in its calyx which has only 1 elongate, subulate tooth, the others being short and the calyx margin nearly undulate.

Centrosema pubescens ranges from the southern United States to Argentina and is found in the Antilles.

Two Panamanian collections, e.g. *Folsom et al. 7174* and *Lewis et al. 677*, are conspicuously different in appearance from the mass of collections of this species from most of its range. The difference consists of much greater pubescence on bracteoles and bracts, the hairs being much denser and longer than in usual material. A number of other collections like these have been taken from widely scattered plants in Central America, but intermediates between this pubescent material and the usual pubescence have not been seen, suggesting that two different taxons are present. Bentham's original description of *Centrosema pubescens* notes bracts densely sericeous villous and bracteoles sericeous, which

seems to apply more to the pubescent plants than the usual less pubescent plants, so recognition of more than one taxon might require renaming of the commoner plants rather than the unusual plants. A study of variation within the full range of material and study of the type collection will be necessary to clarify the taxons and names to be recognized here.

BOCAS DEL TORO: Almirante, *Cooper 76, 189* (both F). Changuinola to 5 mi S of junction of Río Terebe, 100–200 ft, *Lewis et al. 931* (MO). Water Valley, *Wedel 1813* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 4398* (MO), *4947* (SCZ), *6986* (F, MO, SCZ), *7031* (MO); *Shattuck 715* (MO); *Wetmore & Abbe 157* (F, GH); *Woodworth & Vestal 500* (F, GH, MO), *716* (F). Pipeline road N of Gamboa, *Correa & Haines 539* (SCZ). Monkey Hill, *Cowell 45* (NY). Matachin, *Cowell 197* (NY). Pipeline road, 2.3 mi from Gamboa Gate, *Croat 12737* (MO). Miraflores, *Croat 12860* (F, SCZ). Road C21 3 mi from Gaillard Highway, *Croat 13002* (MO). Upper Río Pequení between Salamanca Hydrographic Station and Río Boqueron, 70 m, *Dodge & Allen 17280* (GH, MO). Banks of Quebrada La Palma and Cañon of Río Chagres, *Dodge & Allen 17344* (MO). France Field, *Dwyer 2893* (MO). Cocolí, road to Contractors' Hill, *Dwyer 7218* (MO, NY). France Field, *Dwyer 8520* (F). Chagres, *Fendler 70* (F, US). Ancón Hill, *Frost 2* (F). 0.4 mi SE of junction road K-2 & K-15, *Graham 318* (GH). Ancón, *Greenman & Greenman 5075* (MO). Hills E of Curundú, *Harvey 5194* (F). Paraíso, *Hayes 112, 797* (both NY). Gatún, *Hayes 815* (NY). Pipeline road, *Hladik 51* (NY). Gamboa, *Kennedy & Steiner 2467* (F). Pedro Miguel, *Killip 3348* (US). Ancón, *Macbride & Featherstone 17* (F, US). Boy Scout camp near Madden Lake & dam, *McDaniel 12657* (FSU). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5144* (US). Empire to Mandinga, *Piper 5145, 5156* (both US). Juan Mina, *Piper 5158* (US). Ancón, *Piper 5177* (US). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5179* (F, US). Gatuncillo, *Piper 5180* (US). Old Fort San Lorenzo, *Piper 5979* (US). Río Grande near Culebra, *Pittier 2078* (NY, US). Ancón, *Pittier 2763* (GH, NY, US). Balboa, *Standley 25270, 25486* (both US). Cerro Gordo near Culebra, *Standley 25959* (US). Balboa, *Standley 26067* (US). Corozal, *Standley 27391* (US). Gamboa, *Standley 28513, 29323* (both US). Río Pedro Miguel near East Paraiso, *Standley 29931* (US). Summit, *Standley 30111* (US). Between France Field and Cativa1, *Standley 30305* (US). Balboa, *Standley 30887* (US). Darién Station, *Standley 31576* (US). Howard Air Force Base near Red Devil drop zone, *Tyson 1841* (FSU, MO, SCZ), *1846* (SCZ). 1 mi N of Summit, *Tyson et al. 2743* (GH, MO, SCZ). Miraflores Locks area, *Tyson & Dwyer 2741* (SCZ). Without other locality, without collector (MO-1090658). CHIRIQUÍ: David/Concepción, 60 m, *Burt & Koster 135* (MO). Near Frontera, 100–200 m, *Burt & Koster 147* (MO). Volcán/Cuesta de Piedras, 1000–1200 m, *Burt & Koster 158* (MO). Puerto Armuelles, *Busey 513* (MO). Quebrada Caña Blanca, Burica Peninsula, 40 m, *Croat 22578* (MO). Baja Gualaca, 0–100 m, *Koster 171* (MO). Quebrada Guanabanito beyond La Represa 2 mi SW of Puerto Armuelles 0–200 m *Liesner 129* (NY). Quebrada Punta de Piedra, 2 mi SW of Puerto Armuelles, 0–100 m, *Liesner 346* (MO). Río Dupí, *Pittier 5241* (NY, US). COCLÉ: El Valle de Antón, *Burt & Rattray 39* (MO); *Croat 13290* (MO); *Dwyer 11957* (MO, US); *Lewis et al. 2566* (MO). Aguadulce, *Pittier 4954* (US). 10 mi E of Natá at Río Grande, *Tyson 5216* (FSU, MO, SCZ), *5250* (FSU, SCZ). 4 mi W of Anton on Río Chico, *Tyson & Blum 2596* (MO). Penonomé, 50–100 ft, *Williams 121* (NY). COLÓN: 10 mi SW of Portobelo, 2–4 mi from coast, *Liesner 1091* (MO). DARIÉN: Between Pinogana and Yavisa, 15 m, *Allen 271* (GH, MO, US). Manené, *Kirkbride & Bristan 1566* (NY). Yaviza along Río Chucunaque, *Stern et al. 150* (GH, US). HERRERA: Chitré, 20 m, *Allen 1089* (GH, MO, US). Ocú, 100 m, *Allen 4088* (MO). LOS SANTOS: 1 mi N of Tonosí, *Tyson et al. 2992* (MO, SCZ). PANAMÁ: Taboga Island, *Allen 136* (GH). La Chorrera/Bejuco, 0–100 m, *Burt & Rattray 24* (MO). Punta Chame, *D'Arcy 10235* (MO). Quebrada La Palma and Canon of Río Chagres, *Dodge & Allen 17344* (GH). Taboga Island, *Dwyer 2096* (MO). Río Coronado along Panamerican Highway, *Gentry 2906* (MO). Panama, *Hayes 172* (GH). Taboga Island, *Hunter & Allen 136* (GH, MO). San Jose Island, *Johnston 888, 1010, 1062* (GH). Chimán, *Lewis et al. 3354* (MO). Bellevista, *Macbride 2741* (F). Nuevo Emperador, *Muñoz 35* (MO). La Cresta, *Sandoval 13* (MO). Big swamp E of Río Tocumen, *Standley 26639* (US). Corozal road near Panama, *Standley 26809* (US). Taboga Island, *Standley 27905* (US). Río Tapia, *Standley 28191* (US). Tumba Muerto Road near Panama, *Standley 29703, 29752* (US). Between Las Sabanas and Matías Hernández, *Standley 31817* (US). SAN BLAS: Mouth of Ailigandí river to 2.5 mi inland, *Lewis et al. 76* (GH, MO, US); *Warner 178* (MO). VERAGUAS: Divisa/Santiago, 0–100 m, *Burt & Rattray 74* (MO). Puerto Mutis 12 mi S of Santiago, *Tyson 5190* (FSU, MO, SCZ), *6007* (SCZ).

6. **Centrosema sagittata** (Willd.) Brandegee ex Riley, Kew Bull. 1923: 344. 1923.

Glycine sagittata H. & B. ex Willd., Enum. Pl. 757. 1809. TYPE: not seen.
Centrosema hastata Benth., Comm. Legum. Gen. 56. 1837. TYPE: *Rudolphia dubia* H.B.K., Nov. Gen. Sp. Pl. 6: 432. *tab. 591.* 1823. TYPE: Colombia, not seen, cites *Glycine sagittata* Willd.

Centrosema dubia (H.B.K.) Hemsley, Biol. Amer. Centr. 1: 294. 1880.
Bradburya sagittata (Willd.) Rose, Contr. U.S. Natl. Herb. 8: 46. 1903.

Slender, twining *vine*; stems wiry, puberulent, glabrescent. *Leaves* simple, hastate to deltate, the blades mostly 9–15 cm long, apically acute or acuminate, the basal lobes oblique and obtuse, glabrate, with puberulence on the midvein above; petiolule wrinkled, pilose, 3–4 mm long; petiole shorter than the blade, the conspicuous wing 2–9 mm wide, gradually tapering to the base; stipels subulate, 2-nerved, about as long as the petiolules; stipules narrow, acute, prominently nervate, ca. 6 mm long. *Inflorescences* congested few flowered racemes, peduncle slender, mostly 1–2 cm long, becoming somewhat stout in fruit; bracts resembling the stipules, caducous, bracteoles 2, spathaceous, conspicuously nervate, to ca. 10 mm long. *Flowers* showy, mostly white, with some purple; calyx cupular, pubescent, the teeth subulate, ca. 5 mm long; standard orbicular, nearly flat, emarginate, ca. 5 cm long. *Legume* linear, flat, 12–18 cm long including the acicular beak, the beak 5–10 mm long, the margins evident, narrow, minutely puberulent overall, glabrescent; seeds plump, dark brown, ca. 5 mm long, the hilum along one edge.

CANAL ZONE: Near Ft. Kobbe, *Allen 2026* (GH, MO). Madden Dam, 50 ft, *Lewis et al. 17* (GH, MO). DARIÉN: Without other locality, *Bristan 1506* (MO). LOS SANTOS: Between Macaracas and Tonosí, 1.7 mi W of Highway 50 to El Cortezo, *Hammel 5299* (MO). PANAMÁ: Between Bayano Dam and Cañitas, *D'Arcy 938* (MO). Cañita de Chepo, *Escobar et al. 274* (MO). VERAGUAS: above Santa María along road to Santiago, 250–300 m, *Nee 8122* (MO).

7. **Centrosema vexillata** (Benth., Ann. Nat. Hist. (Paris) ser. 1. 3: 435. 1839. TYPE: Guiana, *Schomburgk* (K, not seen; photo MO).

Vine, sometimes robust, stems sometimes woody pilose with elongate, 2 mm long, weak yellowish hairs. *Leaves* pinnate trifoliolate, leaflets ovate, 5–12 cm long, apically acuminate, the acumen mucronulate, basally obtuse, above with minute hairs, sparingly pilose beneath, especially on the veins, petiolules 2–3 mm long, pilose; petioles slender, drying sharply grooved, pubescent; stipels linear, conspicuous, to 12 mm long, much exceeding the petiolules; stipules conspicuous, ovate, 5–11 mm long, finely nervate, sparingly long pilose. *Inflorescence* few flowered; peduncles slender, elongate, pubescent; bracteoles large, ovate, subspathaceous, nervate, ciliate, glabrous or pubescent, 2–2.5 cm long, 8–10 mm wide; pedicels 10–15 mm long, slender, pubescent; bracts stipule-like. *Flowers* (from Barbarosa-Fevereiro 1970) white; calyx puberulent, the tube 5–6 mm long, the upper teeth completely fused forming a lip 3–4 mm long, 3 mm wide, truncate or emarginate apically, the lower teeth triangular, the laterals 2–3 mm long, the median 5–7 mm long; standard 4.5–5 cm long, 5–6 cm wide, dorsally pubescent. *Fruit* straight, linear to oblong, compressed, ca. 10 cm long, 6–8 mm wide, copiously pubescent, ultimately black; seeds dark brown, rectangular 5–6 mm long.

Centrosema vexillata is distinct in its large stipels, stipules and bracteoles. The flat pubescent pods are also distinctive.

This species ranges from Panama to central Brazil. In Panama it has been found only near the coast.

PANAMÁ: Camino a Río en Chame, *Taylor 91* (PMA). SAN BLAS: Lower Río Ailigandí, *Duke 9324* (MO). Sasardí, 20 m, *Duke 10136* (MO, NY). Molia near Playon Chico, *Stier 65* (MO).

11. CHAETOCALYX

Michael O. Dillon[24]

Chaetocalyx DC., Prodr. 2: 243. 1825; Mém. Légum. 6: 262. 1826. TYPE: *Chaetocalyx vincentina* DC. = *C. scandens* (L.) Urb.

Boenninghausia Spreng., Syst. Veg. 3: 245. 1826. TYPE: *B. vincentina* Spreng. = *Chaetocalyx scandens* (L.) Urb.

Planarium Desv., Ann. Sci. Nat. (Paris) 9: 416. 1826. TYPE: *P. latisiliquum* (Poir.) Desv. = *Chaetocalyx latisiliqua* (Poir.) Benth. ex Hemsley.

Rhadinocarpus Vog., Linnaea 12: 108. 1838. LECTOTYPE: *R. brasiliensis* Vog. = *Chaetocalyx brasiliensis* (Vog.) Benth.

Isodesmia Gardner, London J. Bot. 2: 339. 1843. TYPE: *I. tomentosa* Gardner = *Chaetocalyx tomentosa* (Gardner) Rudd.

Raimondianthus Harms, Notizbl. Bot. Gart. Berlin-Dahlem 10: 387. 1928. TYPE: *R. platycarpus* Harms = *Chaetocalyx platycarpa* (Harms) Rudd.

Twining *vines*, herbaceous to suffrutescent; stems slender, 1–4 mm in diameter, subterete, striate, glabrous to densely pubescent. *Leaves* imparipinnate, 5–7-foliolate, the rachis glabrous to pubescent, 2.0–12.5 cm long; leaflets oblong, elliptical, ovate or obovate, 1–8 cm long, 0.5–5.0 cm wide, entire, acute to obtuse or retuse, mucronulate, basally rounded, cuneate or subcordate, glabrous to pubescent, sometimes micropunctate, pinnately veined; petiolules pulvinate, 1–2 mm long; stipules paired, attached basally, linear to deltoid-ovate, acute to attenuate, entire to setose-ciliate or laciniate; exstipellate. *Inflorescence* terminal or axillary, racemes, panicles, fascicles, or rarely solitary; bracts stipuliform; ebracteolate. *Flowers* 5-merous, 12–30 mm long; calyx campanulate, 5-lobed, subequal, glabrous to densely pubescent with tubercular-based trichomes, or absent, symmetrical to gibbous, basally articulate; corolla yellow or sometimes red to violet striate, the standard obovate to suborbicular, emarginate, the wings oblong, free, clawed, the keel nearly straight, clawed, free basally; stamens 10, filaments connate into a sheath, splitting above, or the vexillary stamen free, occasionally splitting below with maturity, the anthers dorsifixed, ellipsoidal, ca. 1 mm long; ovary sessile or stipitate, 6–16-ovulate, glabrous to densely pubescent, the style filiform, incurved, glabrous, the stigma capitate. *Fruit* a loment, 6–16-articulate, submoniliform, subterete to compressed, linear, reticulate to longitudinally striate, the articles oblong to quadrate; seeds elongate, 2.5–6.0 mm long, 1–2 mm wide, subcompressed, smooth, sublustrous, reddish brown, estrophiolate.

Chaetocalyx includes about 29 species ranging from southern Mexico into the Antilles, through Central America, and in South America in Peru, northern Argentina, southern Brazil and Uruguay. Most taxa occur in more or less mesic habitats up to 200 m. The genus is represented in Panama by only one species, *Chaetocalyx latisiliqua*.

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Literature:

Rudd, V. E. 1958. A revision of the genus *Chaetocalyx*. Contr. U.S. Natl. Herb. 32(3): 207–245.

1. **Chaetocalyx latisiliqua** (Poir.) Benth. ex Hemsley, Biol. Centr. Amer. 1: 268. 1880. TYPE: "Peru," herb. Jussieu (P-JU, holotype, not seen; microfiche MO).—FIG. 11.

Hedysarum latisiliquum Juss. ex Poir. in Lam., Encycl. Méth. Bot. 6: 432. 1804.
Poiretia latisiliqua (Poir.) Desv., J. Bot. (Desvaux) 1: 122. 1813.
Planarium latisiliquum (Poir.) Desv., Ann. Sci. Nat. (Paris) 9: 416. 1826.

Sparingly branched *vines*; stems brownish, puberulent and sparsely pubescent with trichomes ca. 1.5 mm long. *Leaves* 5-foliolate, rachis 4–10 cm long, sparsely sericeous; leaflets oblong-elliptic to obovate, 1–5 cm long, 0.6–3.0 cm wide, entire, obtuse mucronulate, base rounded to cuneate, discolorous, micropunctate, adaxial surface green, puberulent, abaxial surface whitish, lannose and puberulent; stipules lanceolate to linear, 3–10 mm long, 1–3 mm wide, attenuate, entire to setose-denticulate, puberulent. *Inflorescence* racemose, sometimes paniculate or fasciculate, the bracts stipuliform, the pedicels 6–12 mm long, hirsutullous. *Flowers* whitish yellow, 15–25 mm long; calyx campanulate, symmetrical, sparsely setaceous, 5–6 mm long, the tube 4–5 mm long, 3–4 mm in diameter, the lobes deltoid, acute, 1.0–2.5 mm long, usually ciliate; the standard broadly obovate, 10–15 mm long, ca. 15 mm wide, cleft to shallowly denticulate, the wings ca. 15 mm long, ca. 5 mm wide, obovate to oblong, the claw 1–2 mm long, the keel ca. 15 mm long, nearly straight, the claws 1–2 mm long; stamens monadelphous, connate into a sheath, split above, the filaments glabrous, the anthers uniform, versatile. *Fruit* a loment, 12–15-articulate, 6–8 cm long, 7–10 mm wide, linear, compressed, puberulent to subglabrous, margins longitudinally striate, centrally reticulate-striate, the stipe 5–7 mm long, the articles 4–5 mm long, 7–10 mm wide; seeds 2.5–3.0 mm long, ca. 1.5 mm wide, smooth, reddish brown.

This species ranges from Costa Rica to southern Ecuador. It is readily distinguished from the other species occurring in Central America by its 5-foliate leaves and wide fruits. In the province of Esmeraldas, Ecuador, this species is called "chupa-chupa," and its leaves are used to treat skin eruptions. No local names or uses have been recorded from Panama.

Though the type specimen in Jussieu's herbarium is marked "Peru," it was probably collected from present-day Ecuador, since no material has been recorded from Peru.

BOCAS DEL TORO: Region of Almirante, *Cooper 88* (F, NY, US). Changuinola Valley, *Dunlap 369, 400* (both US). Río Teribé, near Quebrada Lukulon, *Kirkbride & Duke 510* (MO, NY, SCZ). CANAL ZONE: Between Farfan Beach and Palo Seco, *Hunter & Allen 435* (MO). Gamboa, *McDaniel et al. 12731* (FSU). 1 km W of Gamboa, *Nee 9439* (GH, MO). Empire to Mandinga, *Piper 5155, 5165* (both US). Around Culebra, *Pittier 2212* (NY, US). Las Cascadas Plantation, near Summit, *Standley 25813, 29540* (both US). Balboa, *Standley 27158, 32153* (both US). Gamboa, *Standley 28322, 28452* (both US). Darién Station, *Standley 31592* (US). CHIRIQUÍ: Burica Peninsula, 6 mi S of Puerto Armuelles, *Busey 578* (MO); *Liesner 425* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5281* (FSU, SCZ). DARIÉN: Santa Fé, *Duke 9478* (MO, NY, US). Teotuma, *Duke 10059* (MO). Río Sabana, ca. 4 mi above Santa Fé, *Duke 10216* (MO, NY). Near Canglón river, *Duke & Bristan 355* (MO).

FIGURE 11. *Chaetocalyx latisiliqua* (Poir.) Hemsl.—A. Habit (×3/5).—B. Flower with one wing petal removed (×1⁴/₅). [After *Skutch 2424*.]

Near Yaviza, *Gentry & Mori 13497* (MO). Puerto Indio, *Hammel 1087* (MO). LOS SANTOS: Road from Tonosí to Guanaco and Ave María, *Tyson et al. 3117* (MO). PANAMÁ: Cerro Campana, *D'Arcy 9554* (MO). Panamá Viejo, *Duke 5719* (MO). Cañita, *Escobar et al. 272* (MO). Vera Cruz, *Lewis et al. 3016* (MO). SE slope of Cerro Campana, *Lewis et al. 3147* (MO). Near Matías Hernández, *Pittier 6898* (NY, US). SAN BLAS: Sasardí, *Duke 10126* (MO, NY). VERAGUAS: 2–4 mi E of Santiago, *Duke 12351* (NY).

12. CLITORIA

Paul R. Fantz[25]

Clitoria L.,[26] Sp. Pl. 753. 1753. TYPE: *C. ternatea* L.

Neurocarpum Desv., J. Bot. Appl. 1: 119. 1813; J. Bot. Appl. 2: 75. 1814. TYPE: *N. janense* Desv. or *N. ellipticum* Desv.

Trees, shrubs, lianas, herbaceous *vines* or suffruticose *herbs,* erect or climbing; pubescence of uncinate (hooked) hairs common. *Leaves* trifoliate, less commonly 5- or 7-foliolate, petiolate, terminal leaflet usually larger; leaflets entire, the midrib and nerves impressed or weakly raised above, prominently raised below, ascending, usually arcuate towards the margin, joining the vein above, the minor veins conspicuously reticulate; stipules and stipels usually persistent, sometimes caducous, striate, usually erect, appressed. *Inflorescences* axillary or cauliflorous, racemose; flowers chasmogamous or sometimes cleistogamous (poorly observed in Panamanian material); pedicels usually paired; bracts 2–6, striate, pubescent adaxially, the inner pair caducous, usually smallest, between the pedicels, the middle pair often persistent, concave, opposite and appressed to the pedicel, sometimes spreading or reflexed in age, the outer pair caducous to semipersistent, between the pedicels; peduncles axillary, 1–several, short, often fascicled, cauliflorous; bracteoles 2, striate, persistent, frequently present in fruit, usually pubescent adaxially. *Chasmogamous flowers* resupinate, showy, bi-sexual, 5-merous, blue, violet, pink, or white, sometimes white fading yellow; calyx funnelform, persistent in fruit, conspicuously nerved, the apex 5-lobed, the upper 2 lobes subconnate, the lowermost lobe narrower, often longest; standard complicate, large and flag-like, erect, emarginate, short clawed, darker towards the edges and on the veins, the wings falcate oblong, spatulate, extending beyond the keel, shorter than standard, adherent in the middle to keel, long clawed, the keel petals incurved, acute, the claw elongate; stamens 10, diadelphous, vexillary stamen free or connate at base, the staminal column incurved, glabrous, often persistent in fruit, the free filaments filiform, the anthers basifixed, uniform; ovary stipitate, linear, compressed, many ovuled, densely pubescent, the style elongate, geniculate near the tip, usually twisting, flattened, bearded lengthwise, the stigma often pubescent around the base. *Fruit* stipitate, linear, compressed, slightly thickened on the upper or both sutures, costate or not, the valves flat or convex, often bearing uncinate (hooked) hairs, usually beaked by the persistent style or style base, splitting spirally, twisting; seeds subglobose or subreniform, glabrous, smooth or with a sticky coat. *Cleistogamous flowers* uncommon, inconspicuous

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[26] A complete list of generic synonyms is provided by Hutchinson (1967). Only *Clitoria* and *Neurocarpum* have been used for Panamanian material.

unless with fruit, petals usually lacking; the calyx infundibular, small, persistent in fruit, bracteolate, 5-lobed; stamens short, free or diadelphous, ovary similar to chasmogamous flowers but smaller, style bent abruptly back towards the base and the stigma in contact with anthers.

Clitoria is a genus of about 60 species, mostly located in the tropics with a few species in temperate zones. The bulk of the genus is neotropical. Tree species are rare and all neotropical. A number of shrubs have climbing tendencies. Several liana species can exist as erect shrubs when grown in open areas. Many species are associated with sandy soil.

The genus is of little economic use. *Clitoria ternatea* is frequently cultivated for ornament as a bushy creeper or as a trellis climber. It is often used as a forage crop for livestock which graze on the pods and leaves. In India, every part of the plant is reported used for medicinal purposes. A few other species are cultivated on a limited scale, planted as contour hedge plants to reduce erosion, to beautify roadways, or as attractive additions to gardens. A few species are used locally for bushrope, fish poisons, or placed in brews to "make a man out of you."

Some species exhibit great variation in leaf size and form, pubescence, stipule or stipel size, and the size of the flower parts, and these variations often can be observed in the same population or on the same plant. The frequently minute and inconspicuous uncinate (hooked) hairs must be viewed with a 25–30× or greater magnification. They are best seen by looking along the edge of a surface or along nerves. Surfaces bearing only uncinate hairs may appear glabrous to the naked eye, e.g. leaf uppersides of *C. guianensis, C. polystachya,* etc. Cleistogamous flowers are common in some species but are often overlooked by collectors. Three Panamanian species are known to bear cleistogamous flowers. Two of these species, *C. polystachya* and *C. guianensis,* are poorly collected from Panama. *Clitoria polystachya* material has deteriorated remnants of the cleistogamous flowers. None of the Panamanian specimens of *C. guianensis* bear cleistogamous flowers.

Clitoria is frequently confused with the genus *Centrosema.* Some members of these genera are superficially similar in appearance, but *Clitoria* differs from *Centrosema* in having funnelform rather than campanulate calyx, a spurless standard, wing petals extending beyond the keel, elongate, apically bent styles bearded lengthwise, and in usually having a stipitate fruit often thickened only along one suture, and with only 1 prominent longitudinal nerve.

Literature:

Bentham, C. 1858. Synopsis of the genus *Clitoria*. Jour. Linn. Soc., Bot. 2: 33–44.

Croat, T. 1974. Notes on the genus *Clitoria* (Leguminosae) in Panama. Phytologia 29: 130–134.

Howard, R. A. 1967. Notes on the cultivated woody species of *Clitoria* (Leguminosae). Baileya 15: 15–18.

a. Leaflets 5 or 7, upper surface with scattered appressed trichomes; inflorescence 1-flowered; bracteoles broadly ovate to orbicular, 5–8 mm wide; legume subsessile ..... 6. *C. ternatea*

aa. Leaflets 3, upper surface glabrous or with only uncinate trichomes (viewed at 30×); inflorescence 2- to several-flowered; bracteoles lanceolate to ovate, 1–4 mm wide; legume stipitate.
  b. Calyx teeth 8–15 mm long; bracteoles 7–15 mm long; leaflet apex obtuse to emarginate; legume costate with one prominent medial nerve on each valve.
    c. Petiole 3–5 mm long; flowers 5–7(7.5) cm long, bluish lavender to pink; pedicels 5–9 mm long; calyx tube 15–22 mm long, 8–11 mm wide at the throat; erect suffruticose perennial ..... 3. *C. guianensis*
    cc. Petiole 25–45 mm long; flowers 4–5 cm long, white, drying yellow; pedicels 2–4 mm long; calyx tube 11–15 mm long, 4–7 mm wide at the throat; herbaceous vine ..... 1. *C. falcata*
  bb. Calyx teeth 2–5(–6) mm long; bracteoles 3–6 mm long; leaflet apex acute to acuminate; legume ecostate.
    d. Flowers pink to rose, occasionally pale violet, 6–8 cm long; calyx tube 17–24 mm long, 9–12 mm wide at the throat; staminal column 43–49 mm long; stipe 20–37 mm long; legume densely pubescent; liana, rarely an erect shrub ..... 4. *C. javitensis*
    dd. Flowers white, 2.5–4 cm long; calyx tube 7–12 mm long, 5–7 mm wide at the throat; staminal column 18–21 mm long; stipe 4–12 mm long; legume glabrate; erect shrub or tree.
      e. Leaves glabrous beneath; peduncles subsessile, to 1 cm long; blade of keel 8–10 mm long, 4–5 mm wide; legume 11–20 cm long, valves flat; stipe 10–14 mm long; tree 4–12 m tall ..... 2. *C. glaberrima*
      ee. Leaves conspicuously pubescent beneath; peduncles elongate, 5.5–8 cm long; blade of keel 6–8 mm long, 2–3 mm wide; legume 3.5–4.5 cm long, valves turgid; stipe 4–7 mm long; shrub 0.6–5 m tall ..... 5. *C. polystachya*

1. **Clitoria falcata** Lam., Encycl. Méth. Bot. 2: 51. 1786. TYPE: Saint-Domingue (P-JU, not seen).

C. rubiginosa Juss. ex Pers., Syn. Pl. 2: 303. 1807. TYPE: Saint-Domingue (P-JU, not seen).
C. glycinoides DC., Prodr. 2: 234. 1825. TYPE: Guiana Gallica, *Poiteau* (K).
Neurocarpum argentum Duch. & Walp., Flora 36: 228. 1853. TYPE: Panama (GOET?—not seen).

Herbaceous *vine*, twining and scandent; stem filiform, 2–3 mm thick, hollow, pubescence uncinate, densely rufo-pilose, becoming less reddish, pilose hirsute to glabrous near the base, striate, infrequently branched, the internodes 7–16 cm. *Leaves* trifoliolate, oblong elliptic, occasionally ovate, the apex obtuse, retuse, mucronate, the base obtuse to rotund, 3.5–7(9) cm long, 1.5–5 cm wide, dark green and glabrous above, pale and densely pilose below, becoming scattered pilose with uncinate hairs on nerves, the veins weakly raised above, prominently raised below, primary nerves 7–9 pairs, alternate, obliquely ascending, secondary nerves reticulate; petiole 2.5–4 cm long, weakly 4-angled to terete, abruptly bent at the base forming an acute to right angle with the stem, pubescent; rachis 0.5–1.5(2.3) cm, similar to petiole; stipules persistent, broadly ovate, acute, striate, pubescence uncinate, sparsely pilose, ciliate, 3–5 mm long, 3–3.5 mm wide; stipels persistent, linear lanceolate, acute, striate, pubescent, 3–7 mm long, 0.5–1 mm wide, longer than petiolules, the terminal stipels slightly shorter than lateral stipels; petiolules 4-angled, 3–4 mm long, dark colored, pubescence uncinate, densely pilose. *Inflorescence* of axillary racemes, 2 or 4(6) flowered, bearing either chasmogamous or cleistogamous flowers, chasmogamous flowers with the peduncle subequal to longer than petiole and rachis, 5–13 cm, the pubescence pilose, uncinate; bracts 4, inner pair not seen, 3–5 mm long, 1.5 mm wide, lanceolate, striate, acuminate, pubescence uncinate, pilose ciliate, becoming re-

flexed in age, outer pair usually narrower; pedicels 2–4(5) mm; bracteoles 7–12 mm long, 3–3.5 mm wide, lanceolate, striate, acuminate, pubescence uncinate, moderately pilose, ciliate, inserted 0.5–1 mm below the calyx; cleistogamous inflorescences with the peduncle 4–6.5 cm long, pilose and uncinate hairs; the bracts 3–3.5 mm long, 0.7–1.3 mm wide; the pedicels 2–3 mm; the bracteoles 6–7 mm long, 1.5–2 mm wide, inserted 0.5–1 mm below calyx. *Chasmogamous flowers* showy, lavender or white, sometimes becoming yellow with age; calyx tube 11–15 mm long, 4–7 mm wide at throat, pubescence uncinate, pilose, the lobes 9–13 mm long, ovate lanceolate, long acuminate, ciliate, 2–4 mm wide at base, the ventral lobe 12–14 mm long; standard 4–5 cm long, 3–4 cm wide, with sparse, appressed hairs denser along nerves and towards the margin, the apex ciliate, the wings extending beyond the keel 5–7 mm, the blade 14–17 mm long, 4–7 mm wide, the claw 9–13 mm long, the keel falcate, 7–9 mm across, 3–4 mm wide, the claw 16–18 mm; staminal column 20–27 mm long, incurved at tip, the free filaments 1–3 mm long, the anthers 1–1.2 mm long, 0.4–0.8 mm wide; ovary ca. 8 mm long, with dense white appressed, ascending hairs, the style 14–18 mm long, bearded, the stigma dilated; *cleistogamous flowers* inconspicuous, calyx tube 5–6 mm, 1.5 mm wide at the base to 2–3 mm wide at the throat, the lobes 5–7 mm long; corolla lacking. *Fruit* brown, slightly curved, biconvex, weakly compressed becoming subquadrangular, costate, 3–4.5(5) cm long, 8–9 mm wide, the pubescence uncinate and with few spreading hairs; stipe 8–9 mm long, enclosed in the calyx with the base of fruit; seeds cuboidal with rounded edges, a slight depression on the lateral faces, 4.5 mm long, 4 mm wide, brown, sticky, 5–8 per pod.

Clitoria falcata is found in Panama in disturbed open areas and savannas, and according to Croat (1974), "in tropical dry forest, premontane moist forest, and tropical moist forest along the Pacific slope." The species occurs in tropical South America, Central America, the West Indies, and tropical Africa.

Plants with chasmogamous flowers have been collected from September through January and with fruits from mid November to early December. Collections of cleistogamous flowers are infrequent, and all such collections were made in December. Cleistogamous flowers were often present with fruit or on the same plant with showy flowers.

CANAL ZONE: Ancón, road to Corozal, *Celestine 37* (US). Roadside near Madden Wye, *Croat 12617* (MO). Road C 21 near Police Lodge, *Croat 12984* (MO). Río Azote Caballo, 66–70 m, *Dodge et al. 16821* (GH, MO). Road C-21, *Duke 5772* (GH, MO). Road K5-16, *Duke 8970* (MO). Paraiso, *Dwyer 7155* (GH, MO). E of Fort Clayton, *Harvey 5102* (F). Hills E of Curundu, *Harvey 5193, 5195* (both F). Paraiso Station, *Hayes 173* (GH), *798* (NY). Corozal, *Killip 3255* (US). Ancón Hill, *Standley 25204* (MO, US). Balboa, *Standley 25416* (MO, US). Río Pedro Miguel near East Paraiso, *Standley 30039* (US). Survival school area, Curundu, *Tyson 1302* (MO, SCZ). Howard Air Force Base near Red Devil Drop Zone, *Tyson 1867* (MO, SCZ). Barro Colorado Island, *Woodworth & Vestal 693* (GH, MO). CHIRIQUÍ: Concepción, 100–200 m, *Burt & Koster 142* (MO). David airport, 25 ft, *Lewis et al. 765* (GH, MO). COCLÉ: Río Guias, *Gentry 5837* (MO). 4 mi W of Antón on Río Chico, *Tyson & Blum 2599* (MO, SCZ). PANAMÁ: El Valle, 350 m, *Burt & Rattray 32* (MO). La Chorrera, *Dodge et al. 16739* (GH, MO). Tocumen, *Dwyer 2993* (MO). San Jose Island, *Harlow 84* (GH). Sabanas, *Heriberto 160* (NY, US). San Jose Island, *Johnston 195* (BM, GH), *829* (GH). Without other location, *Killip 3246* (US). Corozal Road near Panamá, *Standley 26803* (US). Tumba Muerto Road near Panamá, *Standley 29791* (US). Between Matías Hernández & Juan Díaz, *Standley 32066* (US). Camino a Chepo en el centro de Instrucción Militar, *Taylor 125* (MO). PROVINCE UNKNOWN: *Halstead 1850* (NY).

2. **Clitoria glaberrima** Pittier, Bol. Soc. Venez. Ci. Nat. 8: 264. 1943. TYPE: Santa Lucia, Miranda, Venezuela, *Killip & Tamayo 37021* (VEN, holotype; isotypes F, GH, K, NY).

Tree 4–12 m tall, 8.5–38 cm dbh, the pubescence uncinate; branches terete, 3–7 mm thick, glabrous; twigs strigose and uncinate, soon glabrous, drying striate sulcate. *Leaves* trifoliolate 6–16 cm long, 3–9 cm wide, ovate, the apex abruptly narrowed to an acumen, 1–2 cm long, 2–8 mm wide, acute or obtuse, often mucronate, the base rotund to obtuse, glabrous both sides or sparsely pubescent on the midrib, light green, concolorous, membranous; veins impressed above, conspicuously raised below, the lateral veins mostly 7–10, alternate to subpaired, oblique, straight, the tips arcuate, minor veins conspicuously reticulate; petiole long, 3–9 cm, glabrous or glabrate, striate, twisting; rachis 1–4 cm long, as petioles; stipules caducous, 5–7 mm long, lanceolate, acute, striate, pubescence uncinate and sparsely strigose, apically ciliate; stipels caducous, 4–7 mm, subulate (not seen in Panamanian material); petiolules 5–7(9) mm long, weakly 4-angled, rugose, glabrous. *Inflorescences* axillary or at denuded nodes, contracted, to 1 cm long, several flowered; pedicels 3–5 mm long, usually paired, slender, pubescence uncinate, becoming 7–9 mm long in fruit, woody, 2–3 mm thick; bracts 3–5 mm long, lanceolate to ovate, striate, pubescence uncinate; bracteoles 3–5 mm long; inserted 0.5–2 mm below the calyx, deciduous, lanceolate, striate, pubescence uncinate. *Flowers* showy, chasmogamous, white or purple; calyx tube 7–12 mm long, 3–5 mm wide near the base to 5–7 mm wide at the throat, nervate, glabrate, pubescent, the lobes broadly deltoid, the apex acute to acuminate, 2–3 mm long, occasionally to 5 mm long with subulate apex, the ventral lobe subulate, uncinate ciliolate, becoming scarious, 3–6 mm; standard 2.5–4 cm long, 2–2.5 cm wide, white or deep blue, lilac, to purple with darker purple veins at the center, pubescence uncinate, the claw ca. 7–8 mm, the wings white, extending beyond the keel 4–6 mm, oblong with expanded apex, 12–18 mm long, 5–7 mm wide, the claw 8–12 mm long, the keel white, falcate, 8–10 mm across, 4–5 mm wide, the claw 14–21 mm long; staminal column nearly straight, 18–21 mm long, the free filaments 2–3 mm long, incurved, the anthers 1–1.4 mm long, ca. 0.6 mm wide; gynophore ca. 1 mm long, uncinate pubescent, the ovary 9–15 mm long, ca. 1 mm wide, densely white, appressed, sericeous, the style 11–13 mm long, the stigma globular. *Fruit* yellow green, stipitate, usually 1 per node, coriaceous, compressed, swollen around the seeds, depressed between, pubescence uncinate and sparse pilose, the valves straight, (8)11–20 cm long, 16–20 mm wide, twisting 1–1.5 times at maturity, the beak 5–9 mm, the stipe brown, included within calyx, 10–12 mm long, 2–3 mm thick, the expanded tip to 5–7 mm thick, weakly twisted, pilose and uncinate; seeds brown to dark brown, compressed, nearly orbicular, 7–10 mm long, 8–10 mm wide, 2–3 mm thick, smooth, glabrous, 7–12 per pod.

Clitoria glaberrima ranges from Venezuela to southern Mexico, but it is poorly represented in collections outside of Panama. It is found in dry tropical forests. It is found with flowers from August to December, and fruits from October to January.

Venezuelan material differs from the Central American material by having

usually the calyx teeth with subulate tips and teeth 5–6 mm long. Stipules and stipels persist longer. Intermediates are found in Panama with typical teeth to a few with subulate apex tips, and occasionally with stipules. Stipels were not seen in Central American material although scars were present. The distinction in characters is not clear enough to warrant separation of varieties.

CANAL ZONE: 1 mi beyond Madden Dam bridge, *Correa & Dressler 353* (MO). Hill above Thatcher Ferry Bridge, *Croat 17012* (MO, SCZ). Madden Dam, Boy Scout Road, *Dwyer 8387, 9166* (both MO). Madden Dam, *Lewis et al. 8* (MO, UC, US). Farfan Beach Area, *Tyson 1833* (MO, US), *1839* (MO, SCZ); *Tyson & Blum 2606, 2618* (both MO, US), *2619, 2620* (both MO), *3172* (GH, MO). Madden Dam, *Woodson et al. 1553* (GH, MO, US). COCLÉ: 2.5 mi from El Copé, *McDaniel & Cooke 14775* (MO). LOS SANTOS: Las Tablas, *Dwyer 1180* (MO). PANAMÁ: Isla Tabaguilla, *Duke 5882* (MO). Taboga, *Hayes 687* (K, M); *Killip 3180* (US). Alhajuela, *Paul 496* (US). Without other locality, *Pittier 6647* (US). Matías Hernández, *Pittier 6799* (GH, K, M, P, US).

3. **Clitoria guianensis** (Aubl.) Benth., J. Linn. Soc., Bot. 2: 40. 1858.—FIG. 12.

Crotalaria guianensis Aubl., Hist. Pl. Guiane 761 *tab. 305*. 1755. TYPE: *Crotalaria guianensis* Aubl., French Guiana, *Aublet* (?P, not seen; ?isotype, BM).
Clitoria guyanensis (Aubl.) Standley, Contr. U.S. Natl. Herb. 27: 215. 1928.

Plant suffruticose, perennial, low growing, 10–30 cm tall with uncinate pubescence; root stock woody, 2–7 mm thick, rarely branched, pubescent when young; thickened nodose where stem arises; stems usually 1 or few, erect to ascending, unbranched, becoming weakly zigzag above, the internodes usually 2–5 cm long, straight to weakly arcuate, striate, often purplish above, densely pilose when young, glabrate with age. *Leaves* trifoliate, short petiolate, sometimes the lower leaves unifoliate, sessile; leaflets oblong lanceolate, the apex acute or obtuse, mucronate, the base cuneate, 5–14 cm long, 8–26 mm wide, usually 4–10 times longer than wide, dark green, glabrate with minute uncinate pubescence above, pilose on the nerves, pale glaucescent, glabrescent below, the veins prominent on both sides, impressed above, raised below, primary veins 5–8 pairs, alternate, widely spaced, ascending, upcurved near base, minor veins reticulate, petioles (1)3–5(8) mm long, striate, pubescence uncinate, pilose; rachis (1)2–5(7) mm long; stipules ovate lanceolate, acuminate, 5–11 mm long, 2–3 mm wide, striate, pubescence uncinate, pilose ciliate; stipels linear, striate, 3–8 mm long, 1 mm wide, pubescence uncinate, pilose ciliate; petiolules 1.5–3 mm, pubescence uncinate, pilose. *Inflorescence* axillary, 2-flowered racemes or occasionally 2 pairs of flowers, chasmogamous, or cleistogamous; in chasmogamous flowers the peduncle 0.5–3.5 cm long, longer than the petiole, pubescence uncinate, pilose, striate, expanding at the tip; bracts 2,4,(6), the inner pair deciduous, 2 mm long, ca. 0.2 mm wide, the middle pair persistent, ovate, striate, pubescence uncinate, ciliate, 4–6(9) mm long, 1.5–2.5 mm wide, concave around the pedicel, the outer bracts semideciduous, 3–5 mm long, 1 mm wide; pedicels 5–9 mm long, pilose; bracteoles lanceolate, persistent, striate, pilose, ciliate, 9–12(15) mm long, 2.5–4 mm wide, inserted 1–2 mm below the calyx, rarely alternate and 3–6 mm below the calyx; in cleistogamous flowers, the peduncle 2–7 cm, pedicels 2–3 mm long; bracteoles 4–7 mm long, 1–1.5 mm wide, inserted 0.5–1 mm below the calyx. *Flowers* blue lavender, pinkish or white with a prominent purple to yellowish green midline and nerves on inner surface of the standard; calyx tube 15–

FIGURE 12. *Clitoria guianensis* (Aubl.) Benth.—A. Habit (×½).—B. Flower (×¾).—C. Corolla.—C^1. Standard (×½).—C^2. Wing petal (×½).—C^3. Keel petal (×½).—D. Stamens (×¾).—E. Pistil (×¾). [After *Ebinger 987.*]—F. Fruit. [After *Drouet 2555.*]

22 mm long, 4–6 mm wide at the base to 8–11 mm wide at the throat, pubescence uncinate, pilose, the lobes 8–15 mm long, broad, 5 mm wide at base, oblong to ovate lanceolate, acuminate, ciliate, usually prominently 3-nerved, subequal; standard 5–7(7.5) cm long, 4.5–5.5 cm wide, glabrous outside except weakly uncinate to short ciliate near the tip, the wings extending 7–10 mm beyond the

keel, the blade 21–27 mm long, 7–10 mm wide, the claw 13–19 mm long, the keel falcate, the blade 13–15 mm across, 5–6 mm wide, the claw 22–29 mm long; staminal column 32–37 mm long, persistent, the free filaments 2–5 mm long, incurved, the anthers 1.4–2 mm long, 0.8–1 mm wide; gynophore ca. 6 mm long, the ovary ca. 8 mm long, compressed, linear, costate, densely pubescent, the style ca. 24 mm, the stigma dilated, ca. 8 mm diam. *Fruit* brown, stipitate, weakly convex, the valves 3.5–5 cm long, 6–10 mm wide, the persistent style beak to 11 mm, valves twisting at maturity; stipe enclosed in the calyx, ca. 11–12 mm long; seeds globose, dark reddish brown, smooth, sticky, glabrous, 3.5–4 mm long, 3–3.5 mm wide, 7–8 per pod; fruit of cleistogamous flowers 7–11 mm wide, glabrate, with violet sutures. *Cleistogamous flowers* small, inconspicuous corolla 1–2 mm, usually lacking; calyx tube 5–9 mm long, 1.5–2 mm wide at the base, 2–5 mm wide at the throat, pubescence pilose, minutely pubescent, the lobes 2–4 mm.

Clitoria guianensis ranges from tropical South America to southern Mexico, and is also present on some of the West Indian Islands. This species is frequently confused outside Central America with a superficially similar species of South America, the West Indies, Africa, and the East Indies. This second species is usually called *Clitoria laurifolia* Poir. or *C. cajanifolia* Benth. and is easily distinguished from *C. guianensis* by its sericeous, grayish-canescent leaflets below.

Clitoria guianensis is found in Panama in dry open pastures, savanas, and roadsides of tropical moist forest and premontane forest. Flowering occurs from January to August. Fruits were collected in March, July and August. Cleistogamous flowers are yet unknown from Panama but the majority of fruiting specimens from South America result from cleistogamy. They are borne from January to June.

This species shows wide variation in size of leaflets, stipules, bracteoles, and calyx.

CHIRIQUÍ: Without locality, *Wagner,* May 1858 (M). COCLÉ: Llanos outside of Penonomé, *Ebinger 1011* (F, MO). Penonomé and Coclé, *Stern et al. 987* (MO). Penonomé, 50–1000 ft, *Williams 99* (NY). PANAMÁ: Taboga Island, *Allen* 115 (MO). Cerro Campana, *Bartlett & Lasser 16905* (MICH); *Croat 14192* (F, MO); *Dwyer et al. 4844* (MO). Taboga Island, 0–250 m, *Miller 2022* (US); *Pittier 3572* (NY).

4. **Clitoria javitensis** (H.B.K.) Benth., J. Linn. Soc., Bot. 2: 42. 1858.

4a. **Clitoria javitensis** var. **portobellensis** (Beurling) Fantz, comb. nov.

Neurocarpum javitense H.B.K., Nov. Gen. Sp. Pl. 6: 409. 1823. TYPE: In ripa fluminis Tuamini prope Javitam, Missiones del Rio Negro, Venezuela, *Humboldt & Bonpland* (P).

Clitoria portobellensis Beurling, Kongl. Vetensk. Acad. Handl. p. 119. 1854. TYPE: In silvis montium, Portobelo, *Billberg,* Apr. 1826 (S).

Liana, high climbing to treetops or less commonly an erect shrub 2–4 m tall, the pubescence uncinate; stems to 1 cm thick, the branches terete, 3–8 mm thick, usually hollow, longitudinally striate sulcate, uncinate pubescent and short rufopilose, becoming glabrate; bark dark colored, splitting in longitudinal strips exposing a light-colored interior. *Leaves* trifoliolate, leaflets mostly oblong elliptic, narrowed rapidly to an acumen 1–2 cm long, the apex obtuse to acute, mucronate, the base broad, cuneate to obtuse, upper surface glabrous, short pilose on the midrib, rarely pilose on the primary nerves, the lower surface pilose to strigose,

becoming glabrate with few scattered hairs or hairs confined to midrib and major nerves, 7–15(18) cm long, 3–7(9.5) cm wide, the veins impressed above, raised below, the lateral veins alternate, 9–13 pairs, basally parallel to the midrib, then straight ascending with arcuate tips, minor nerves conspicuous, nearly parallel and perpendicular to the lateral veins from the middle to the tip, minor veins conspicuously reticulate; petiole 4–11 cm, longitudinally striate sulcate, often gradually twisting, the pubescence uncinate and rufo-strigose to pilose, glabrescent; rachis 1–3 cm long, stipules deciduous, ovate to lanceolate, (4)6–7 mm long, 2–3 mm wide, striate, pubescence strigose, the apex densest and ciliate; stipels linear to subulate, subequal to shorter than petiolule, deciduous, lateral stipels 4–7 mm long, 1.5 mm wide, the terminal stipels 1–3 mm long, 0.5–1 mm wide, pubescence uncinate and strigose to pilose; petiolules (3)4–6(8) mm long. *Inflorescences* axillary and cauliflorous, 0.5–4 cm long, several flowered, the internodes crowded 4–8 mm long, flowers usually paired at the nodes, axes usually densely pilose; bracts usually 3, persistent, 4–6 mm long, 1.5–3 mm wide, ovate, acuminate, weakly concave and appressed to pedicel, spreading to reflexed in age, striate, pubescence uncinate and strigose; pedicels 4–6 mm, strigose pilose, 1 mm thick, becoming 5–8 mm long in fruit, 3 mm thick, glabrate; bracteoles ovate to lanceolate, 4–6 mm long, 1.5–3 mm wide, acuminate, strigose ciliate, striate, inserted 1 mm below calyx. *Flowers* showy, chasmogamous, various shades of pink, rarely violet, the standard having darker pink, red, to purple lines within, the wings and keel white to pale pink; calyx tinged purple, finely strigose, striate, the tube 17–24 mm long, 5–8 mm wide near base to 9–12 mm wide at the throat, the lobes 4–5(6) mm long, broadly ovate, ca. 3 mm wide at the base, abruptly narrowed to the 2 mm long acumen, strigose and tinged red; standard (5.5)6.5–8.0 cm long, 3.5–4.5 cm wide, claw ca. 15–19 mm, densely rufo-velutinous outside in bud, tawny tomentose at maturity, the wings extending beyond the keel 8–10 mm, the blade 25–30 mm long, 7–10 mm wide, the claw ca. 18–27 mm and uncinate pubescent, densest near the base of the blade, the keel falcate, the blade 11–17 mm across, 4–6 mm wide, the claw 30–38 mm; staminal column nearly straight, 43–49 mm long, the free filaments 3–4 mm, curved abruptly inward, the anthers 1.8–2 mm long, ca. 0.7 mm wide; gynophore ca. 1 mm long, densely pubescent, the ovary 18–22 mm long, 1.5–2 mm wide, dense rufo-tomentose, the style 16–25 mm long, pilose bearded and uncinate, the stigma subcapitate, ca. 0.9 mm wide. *Fruit* stipitate, brown, hanging, the valves flat but weakly turgid around the seeds, densely rufo-strigose, 19–23 cm long, 18–24 mm wide, the beak usually 4–6 mm long, twisting at maturity, the stipe 24–33 mm long, 2–3 mm thick, included in the persisting calyx to shortly exserted, pubescence uncinate and reddish pilose strigose; seeds nearly orbicular, compressed on 2 sides, dark brown, smooth without a sticky coat, 9 mm long, 9–10 mm wide, 3 mm thick.

This showy species is noted throughout Panama for its pink flowers flowering from September to May with most collections of flowering specimens during December through February. Fruits are infrequently collected, usually in April and May, although *Gentry 2279* collected fragments of the fruit, perhaps from the previous season, in October, and *Gentry 4438* collected juvenile fruits in February.

BARRO COLORADO ISLAND: *Aviles 85a* (MO); *Bangham 599* (F, GH); *Brown 101, 136* (both F); *Croat 4216* (MO, NY), *4615* (MO), *4853* (F, MO, SCZ), *4967, 5067, 5285, 5333, 5595, 6605, 6734, 7071, 7077, 7091, 7340A, 7732, 7929, 8289, 8497, 8905, 9310, 12847* (all MO); *Duke 15039* (NY); *Dwyer 8452* (GH, MO); *Frost 8211/2* (F); *Graham 204* (GH); *Hunnewell 16424* (GH); *Killip 40030* (F, MO); *Montgomery 74* (MO); *Shattuck 312* (F, MO); *Wetmore & Abbe 6* (F, GH, MO), *6A* (GH, MO); *Wetmore & Woodworth 64, 71* (F, GH); *Woodworth & Vestal 347* (F, GH), *478* (F), *598* (F, GH), *675* (F, GH, MO), *735* (F, GH); *Wilson 23* (F, MO); *Zetek 15002* (F). CANAL ZONE: Juan Mina plantation, Río Chagres, region above Gamboa, 25 m, *Allen 4114* (G, MO). Gamboa, *Allen 3931* (G, MO). Frijoles, *Croat 13223* (MO). W arm of Quebrada Salamanca, 70 m, *Dodge et al. 17007* (G, GH, MO). Pipeline Road, 2–4 mi N of Gamboa, 100 m, *Gentry 6531* (MO, USF). Between Summit and Gamboa, *Greenman & Greenman 5239* (MO). Around Gorgona, *Guillard 2405* (US). Frijoles Station, *Hayes 492* (BM, E, K, M). Chagres River near Gatún, *Hayes 679* (NY). Gamboa Road, *Jones 268* (US). Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5107* (US). Empire to Mandinga, *Piper 5140* (US). Culebra, 50–150 m, *Pittier 2231* (US). Between Alhajuela & El Vigia, *Pittier 2368* (US). Between Gorgona & Mamei, 10–30 m, *Pittier 2405* (GH, NY). Hills around Agua Clara Reservoir near Gatún, 20–30 m, *Pittier 2652* (F, NY, S, US). Las Cascada Plantation, *Standley 29557* (US). CHIRIQUÍ: Corotú, 6 m SW of airport of Puerto Armuelles, *Busey 399* (MO). Quebrada Manzanillo, 9 km S×SW of Puerto Armuelles, *Busey 733* (MO). COLÓN: Portobelo, *Billberg*, Apr. 1826 (S). Near Salamanca, 8 mi E of Transisthmian Highway, 100 m, *Gentry 6704* (MO). 10 mi SW of Portobelo, 2–4 mi from coast, 10–200 m, *Liesner 1084* (MO). Peluca, ca. 27 km from Transisthmian Highway on road to Nombre de Dios, Trail to Río Boqueron, *Kennedy 2642* (MO). DARIÉN: Río Sambú, 0–5 mi above Río Venado, *Duke 9262* (MO, NY, US). Piñas, *Duke 10617* (MO). Quebrada Sierre from Río Tuira to track between Ríos Cube & Ponus, *Gentry 4438* (MO). Mannene to Mouth of Río Cuasí, *Kirkbride, Jr. & Bristan 1402* (MO). Lucutí, Chepigana District, 50 ft, *Terry & Terry 1372* (F, GH, MO). PANAMÁ: San Jose Island, *Andersson 1852* (S). Panamá, *Cumming 1142* (BM, GH, K). San Jose Island, *Erlanson 35* (G, NY, US), *177* (GH). Río Pasiga to above waterfall on 2nd main fork, *Gentry 2279* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 92* (G, MO). San Jose Island, *Johnston 538, 628* (both GH), *670* (GH, MO), *1351* (GH). Panamá, *Sinclair* (K).

5. **Clitoria polystachya** Benth., Pl. Hartw. 60. 1840. TYPE: prope Talea, Mexico, *Hartweg 454* (CGE, K).

Clitoria multiflora Mart. & Gal., Bull. Acad. Roy. Sci. Bruxelles 10: 188. 1843. SYNTYPES: Bois de Comaltepeque, Oaxaca, Mexico, *Galeotti 3232* (BR, F, G). Savanas, Cordillera, Mirado, Vera Cruz, Mexico, *Galeotti 3290* (BR).

Clitoria velutina Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 24. 1940. TYPE: Panama, *Davidson 784* (F, holotype; isotypes A, MO).

Shrub 0.6–5 m tall; branches 3–6 mm thick, pubescence dense, short, tawny, spreading pilose on juvenile branches, becoming gray, glabrate, the internodes 1–4 cm long. *Leaves* trifoliolate, membranous, oblong lanceolate to oblong ovate, dark green with uncinate pubescence and occasional scattered hairs above, dull, pale green, moderately dense, velutinous pilose below, the apex long acuminate, the mucro to 2 mm long, the base rotund to weakly emarginate, 4–11.5 cm long, 2–5 cm wide, the veins impressed above, raised below, primary veins 8–12, alternate, straight with arcuate tips; petioles 4–8 cm, angular, striate, densely tawny spreading pubescent; rachis 1–3 cm; stipules persistent, 6–8 mm long, 1.5–2 mm wide, attenuate, 1–2 mm, linear lanceolate, acute, striate, densely pilose; stipules persistent, terminal 4–7 mm long, lateral 6–10 mm long, 0.5–1 mm wide, linear, acute, densely pilose. *Inflorescence* an axillary few-flowered panicle, the flowers chasmogamous or cleistogamous, pubescent, in chasmogamous flowers the inflorescence 5.5–8 cm long, internodes 6–10 mm long, the lateral branches short, 4–6 mm long, 2–3 flowers per branch; bracts usually 2, 4–5 mm long, linear, acute, densely pilose; pedicels 3–5 mm; bracteoles persistent, 6 mm long, 1 mm wide, inserted 1–2 mm below the calyx, linear, acute, densely pilose; in cleistogamous flowers the inflorescences to 2 cm; bracts 2–3 mm long, the pedicels 2–3 mm

long; bracteoles 3–4 mm. *Flowers* with cleistogamous flowers inconspicuous; petals absent; calyx tube 5–6 mm long, 1–1.5 mm wide at the base to 2 mm wide at the throat, pilose, lobes 2 mm, chasmogamous flowers white with dark red centers inside the standard; calyx tube 8–11 mm long, 2–3 mm wide at the base to 5–6 mm wide at the throat, sometimes oblique to the pedicel, pubescence uncinate, pilose, the lobes deltoid ovate, 3–4 mm long, 2 mm wide at base, acuminate, sparsely pubescent, the ventral lobes 6–7 mm long; standard 2.5–3 cm long, 19–20 mm wide, moderately strigose, the wings extending beyond the keel ca. 2–3 mm, the blade ca. 12 mm long, 5 mm wide, the claw ca. 11 mm long, the keel falcate, ca. 6 mm across, 3 mm wide, the claw ca. 15 mm long; staminal column ca. 18–19 mm long, free filaments 2–3 mm, incurved, the anthers 1 mm long, 0.4 mm wide; ovary ca. 8 mm long, 0.8 mm wide, with dense white, appressed hairs except near the mid lateral face, the style ca. 14 mm long, curved abruptly 5 mm from tip. *Fruit* stipitate, brown, weakly convex, ecostate, the uncinate pubescence sparsely strigose to glabrate, 3.5–4 cm long, 8–8.5 mm wide; seeds dark brown, weakly reniform, the base and apex truncate, sticky, 2–2.5 mm long, 3.4 mm wide, 2 mm thick.

This species is known in Panama from only two collections. In northern Central America, the species is often found in pine forests or oak woods at 800–2,300 m or occasionally to 5,000 m. The species bears chasmogamous flowers from June to October. Cleistogamous flowers and fruits are known from June, August, and November to January.

CHIRIQUÍ: Savanna, Boquete, 5000 ft, *Davidson 784* (A, F, MO, US). Cerro de Lino above Boquete, *Pittier 3025* (US).

6. **Clitoria ternatea** L., Sp. Pl. 2: 753. 1753. TYPE: herb Linnaeus (LINN 902.1, not seen; microfiche seen).

Herbaceous vine, twining in understory; stems terete, 1–2 mm thick, weakly striate, strigose, densely strigose when juvenile, branched near the base, infrequently branched above, internodes usually 5–15 cm long. *Leaves* odd pinnate; leaflets 5 or 7, membranous, ovate or elliptic, the apex retuse, mucronate, the base cuneate to broadly cuneate, 1.5–4.5 cm long, 1–3.5 cm wide, concolorous, the upper surface with scattered strigose hairs to glabrate, strigose to sparse strigose below, more conspicuous on major nerves, the veins weakly raised above, conspicuously raised below, primary veins 5–6 pairs, alternate, ascending minor nerves reticulate, marginal nerve strigose; petiole 1.5–3 cm, weakly striate sulcate, strigose; rachis 2–6 cm long, internodes 1–2.5 cm long, weakly striate, often adaxially canaliculate, strigose; stipules persistent, linear, 4(5) mm long, 0.5–0.8(1.0) mm wide; striate, pubescence uncinate, sparsely strigose; stipels persistent, acicular, inconspicuous, pubescence uncinate, sparsely strigose, 1–2 mm long; petiolules subquadrangular, pubescence uncinate, strigose, 2(3) mm long. *Inflorescence* reduced to a solitary, axillary, chasmogamous flower; peduncle (4)7–12 mm, glabrous, the apex with 2 pulvini; bracts 2, ovate, acuminate, striate, concave and appressed to the pedicel or spreading ascending, the pubescence uncinate, ciliate, 2–3 mm long, 1 mm wide; pedicel strigose and uncinate, often twisting or bending at the swollen base, 3–6 mm long; bracteoles conspic-

uous, membranous, broadly ovate to nearly orbicular, appressed to the calyx, pubescence uncinate, sparsely strigose 6–10 mm long, 5–8 mm wide. *Flowers* showy, blue to violaceous; calyx membranous, conspicuously nerved, glabrate with uncinate hairs and rarely few scattered strigose hairs, the tube 9–14 mm long, 7–9 mm wide at the throat, the lobes 8–12 mm long, 3 mm wide at base, oblong, apically rounded, the excurrent nerve 1–2 mm long, ciliate, with uncinate hairs on nerves; standard 3.5–5.5 cm long, 2.5–3 cm wide, emarginate, the edges drying purple with strigose and uncinate hairs outside, denser towards the margin, the wings colored as the standard, the blade ca. 26 mm long, ca. 12 mm wide, extending beyong the keel 8–10 mm, the claw ca. 8 mm long, the keel falcate, ca. 9 mm long, ca. 6 mm wide, the claw ca. 15–17 mm; staminal column 17–19 mm, nearly straight below, weakly curved for last 3–4 mm, the free filaments 3–4 mm long, the vexillary filament curved, the anthers 1 mm long, 0.6–0.8 mm wide; gynophore ca. 1 mm long, the ovary 11–12 mm long, 1.5 mm wide with dense appressed ascending white hairs, the style ca. 15 mm, basally pubescent, becoming bearded towards the apex, densely bearded below the stigma. *Fruit* subsessile, basally enclosed at the base within the calyx, splitting the calyx tube, light brown becoming tan, slightly thickened along both sutures, the pubescence uncinate and strigose, becoming sparse with age; valves 10–11 cm long, 9–11 cm wide, nearly straight; seeds rectangular subreniform, smooth, glabrous, 5–6 mm long, 4 mm wide, 1.5–2 mm thick, 10 per pod.

A native of the Old World tropics, *Clitoria ternatea* is frequently prized in the neotropics, including Panama, as a cultivated ornamental. It often escapes and flourishes. Double flowered and white flowered forms from cultivation are known.

Specimens have been collected in flower in Panama in February, April, July, August, and November. Specimens with mature fruits and flowers were collected in February and August.

PROVINCE UNKNOWN: Panamá, *Andersson,* Apr. 1852 (S). *Mell,* 8 Feb. 1926 (NY). BOCAS DEL TORO: Water Valley, Chiriquí Lagoon, *Wedel 1771* (GH, MO). Little Bocas, Chiriquí Lagoon, *Wedel 2511* (GH, MO). CANAL ZONE: Government forest along Cruces Trail, 75 m, *Hunter & Allen 740* (GH, MO). Balboa, *Wall 383* (S). PANAMÁ: Punta Paitilla, *Taylor & Correa,* 12 Aug. 1970 (MO).

13. COLOGANIA

W. G. D'Arcy[27]

Cologania Kunth, Mimoses 205. 1819. LECTOTYPE: *C. angustifolia* Kunth.

Perennial *herbs* or *vines*; stems mostly slender, glabrate to pilose. *Leaves* 1–3-pinnate trifoliolate, leaflets ovate, oblong, or linear, mucronulate, pellucid, stipels subulate; stipules narrow, somewhat striate. *Inflorescences* axillary, short racemes or solitary flowers, sometimes aggregated as few flowered panicles, sometimes the flowers clustered to appear umbellate; bracts and bracteoles persistent, the bracteoles 2, inserted below the calyx and mostly much shorter than the calyx; pedicels evident. *Flowers* violet, showy; calyx tubular, the upper 2 teeth at least partly connate, the lowest tooth longest, somewhat gibbous basally;

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standard elliptical, emarginate, erect, laterally reflexed, wings oblong, the claw obtuse, the keel much smaller than the wings; stamens diadelphous, the vexillary stamen free, the anthers alike or alternate ones slightly smaller; ovary linear, pubescent, many ovuled, stipitate, the style incurved, glabrous, the stigma globose. *Legume* linear, compressed, elastically dehiscent by 2 valves, pilose; seeds numerous, compressed, lenticular or quadrate, the hilum oblong.

Cologania is distinguished mainly by its tubular calyx. The genus is best developed in Mexico, but ranges southward to Argentina and north into the southern United States. It includes 6–10 species. A few species have been cultivated for ornament.

Literature:

Rose, J. N. 1903. Synopsis of the species of *Cologania*. Contr. U.S. Natl. Herb. 8: 34–42.

a. Leaves trifoliolate, the leaflets ovate, chartaceous or membranaceous, the lateral venation ascending at about 45° ---------- 1. *C. biloba*
aa. Leaves unifoliolate (simple), the leaflets linear to narrowly ovate, subcoriaceous, the lateral venation strongly ascending ---------- 2. *C. procumbens*

1. **Cologania biloba** (Lindl.) Nicholson, Gard. Dict. 1: 363. 1884–9.

Glycine biloba Lindl., Bot. Reg. *tab. 1418*. 1831.

Trailing *herb*; stems slender, pilose. *Leaves* pinnate trifoliolate, the leaflets ovate, mostly 1.5–2.5 cm long chartaceous, apically obtuse, mucronulate, slightly lighter and the venation more prominent beneath, short pilose on both sides, basally rounded; petiolules 1–2 mm long, pilose; rachis ca. 3 mm long; petioles rarely as long as the terminal leaflet; stipels shorter than the petiolules; stipules ca. 2 mm long. *Inflorescence* 1–?2-fasciculate, axillary, the pedicels ca. 5 mm long) bracteoles 2, subulate, ca. 3 mm long, inserted near the top of the pedicel and barely exceeding it. *Flowers* showy, blue; calyx tubular, ca. 10 mm long, 3.5 mm wide, spreading pilose, the teeth short; standard exserted ca. 11 mm from the calyx. *Legume* not seen.

This species is known in Panama from only one collection taken on the lava flows west of El Baru, the same area where the other species of *Cologania* has been collected. The two species are amply different in leaf shape and pubescence.

Cologania biloba is one of a species complex which ranges from Panama to the southern United States. The name used here is supported by a good color illustration which resembles the Panamanian plant. Only one other name in the complex, *C. broussonetii* (Balb.) DC., based on *Glycine broussonetii* Balbis (1813) is older. Neither the name *C. biloba* nor *C. broussonetii* is in current use for plants of Central America, but none of the later names is clearly more acceptable for application to the Panamanian population.

CHIRIQUÍ: 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5832* (FSU, MO).

2. **Cologania procumbens** Kunth, Mimoses 205, *tab. 57.* 1819. TYPE: Colombia, *Humboldt & Bonpland,* not seen.—FIG. 13.

Trailing perennial *herb,* rootstock stout; stems short pilose with reflexed white hairs, branching mostly near the base. *Leaves* 1-foliolate, narrowly ovate to linear, mostly obtuse, mucronulate, basally rounded, often minutely cordate, subcoriaceous, glabrate, lateral nerves strongly ascending; petiolules less than 1 mm long with some long hairs; petioles mostly less than 10 mm long; stipels subulate, longer than the petiolules; stipules ca. 5 mm long, 0.5–2 mm wide, striate, pubescent. *Inflorescences* axillary 1–2-flowered fascicles; pedicels pilose, 8–15 mm long; bracts stipule-like; bracteoles subulate, long ciliate, 2–3 mm long, inserted ca. 1 mm below the calyx. *Flowers* showy, light purple; calyx tubular, 7–8 mm long, the teeth short, acute, the lowest the longest, sometimes somewhat purplish, sparingly pilose; standard ca. 2 cm long, glabrous, erect. *Legume* linear, ca. 5 cm long, ca. 3 mm wide, somewhat compressed, the beak short or indistinct, the stipe enveloped by the persistent calyx, hispid, especially at the apex; seeds not seen.

This species is distinctive in its unifoliolate, glabrate, coriaceous leaves which may vary considerably in shape on the same plant but which tend to be narrow. The erect blue flowers with erect standard and tubular calyx are good features for recognition.

Cologania procumbens ranges from Mexico to Panama and into South America. In Panama it has been collected on lava flows at ca. 1,000 m elevation.

CHIRIQUÍ: Llanos, slopes of Volcán de Chiriquí along Río Chiriquí Viejo, 1200 m, *Allen 992* (MO). Near Volcán, 1300 m, *Burt & Koster 155* (MO). Chiriquí Viejo Valley, *White 100* (MO, US).

14. CRACCA

Peter S. White[28]

Cracca Benth. in Benth. & Oerst., Vidensk. Meddel. Dansk. Naturhist. Foren. Kjøbenh. 1853: 8. 1853. Nomen conserv. TYPE: *Cracca glandulifera* Benth.

Cracca L., Sp. Pl. 752. 1753; Gen. Pl., ed. 5. 1754. Nomen rejic. contra *Cracca* Benth. TYPE: *Cracca villosa* L. = *Tephrosia villosa* (L.) Pers. Not *Cracca* Hill, Brit. Herb. 285. 1756. TYPE: not designated, = *Vicia* L. Nor *Cracca* Medic., Vorl. Chrupf. Phys.-Ökon. Ges. 2: 359. 1787. TYPE: *Cracca benghalensis* (L.) Medic. = *Vicia benghalensis* L.

Benthamantha Alef., Bonplandia 10: 264. 1862. TYPE: *Benthamantha glandulifera* (Benth.) Alef. = *Cracca glandulifera* Benth.

Brittonamra Kuntze, Rev. Gen. 1: 164. 1891. TYPE: *Brittonamra caribaea* (Jacq.) Kuntze = *Cracca caribaea* (Jacq.) Benth.

Perennial *herbs,* sometimes shrubby, usually pubescent, at least when young. *Leaves* alternate, imparipinnate, petioled, the lateral leaflets more or less opposite, leaflets 3–many, oblong or elliptic, pubescent, often larger toward the tip of the leaf, petioluled, stipellate, stipulate. *Inflorescence* of axillary racemes, usually relatively few flowered, pedicels solitary in setaceous bracts. *Flowers* with cam-

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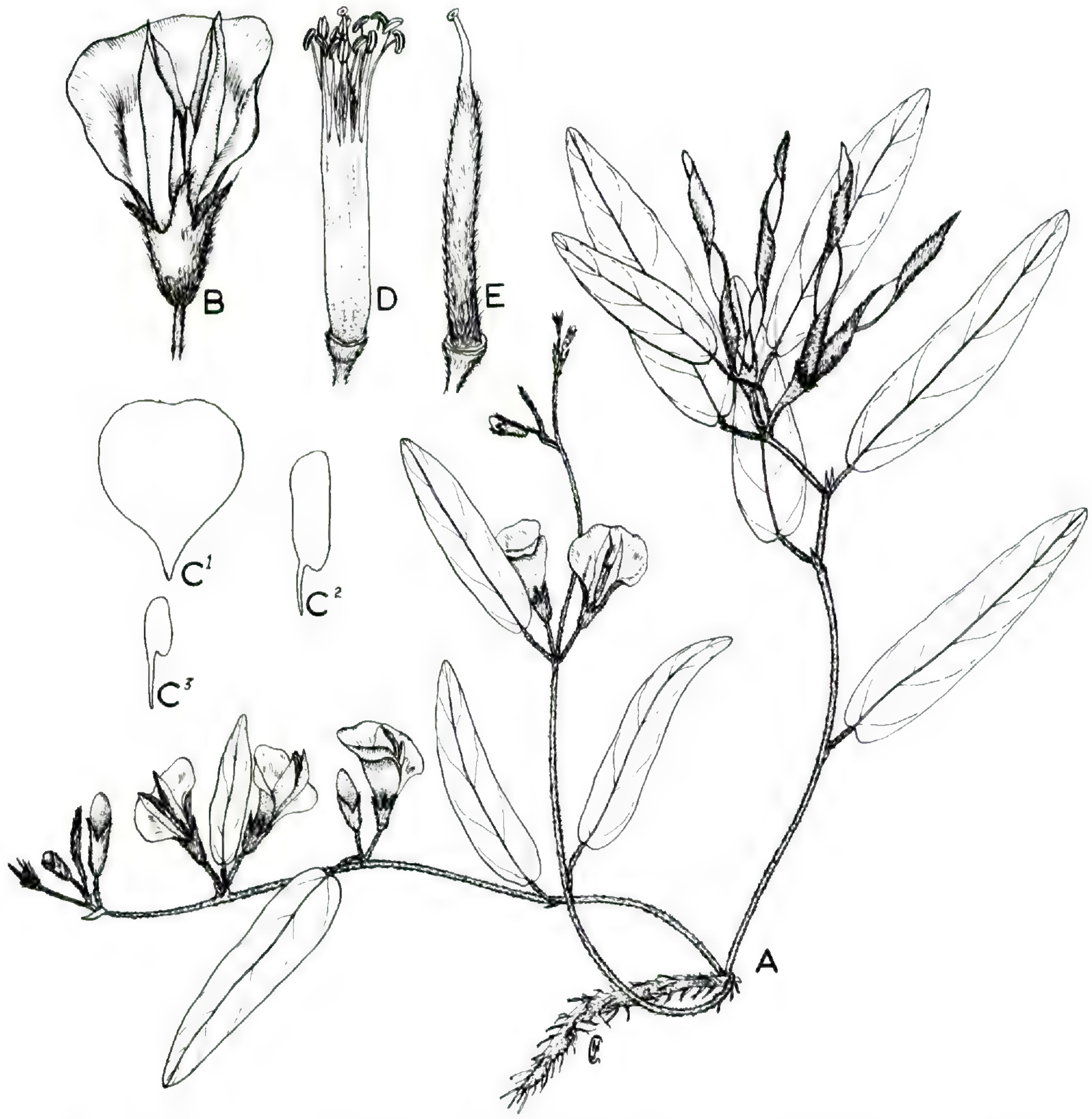

FIGURE 13. *Cologania procumbens* Kunth.—A. Habit (×½).—B. Flower (×1½).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×3).—E. Pistil (×3). [After *Allen 992*.]

panulate to funnelform hypanthium, teeth 5, narrow triangular to acuminate, more or less equal, petals yellowish or whitish, clawed, subequal, wing petals free, keel petals fused to apex; stamens diadelphous, odd filament free, alternate filaments from sheath somewhat unequal; ovary sessile, linear, compressed, pubescent, ovules numerous, style bearded along upper inside, the stigma terminal, capitate. *Fruit* sessile, linear, compressed, 2-valved, septate within between the seeds, the partitions marking off regular square or rectangular pockets holding the seeds, constricted outside between the seeds, the valves sometimes coiling in dehiscence; seeds many, compressed and square or rectangular in outline.

Cracca Benth. is a genus of about 10 species distributed from the southwestern United States to Argentina and also in the West Indies. The fruits, which are linear and regularly septate within to form more or less square chambers, are distinctive. Differences with *Tephrosia* Pers. are discussed under that genus.

The nomenclatural confusion among *Cracca* Benth., *Cracca* L., *Cracca* Hill, *Cracca* Medic., *Benthamantha* Alef., and *Brittonamra* Kuntze has also been discussed in the treatment of *Tephrosia* Pers. Two applications of the name *Cracca* were those of Hill (1756) and Medic. (1787), both applying the name to species of *Vicia* L. (1753). *Cracca* L. (1753) (=*Tephrosia* Pers., nomen conserv.) created confusion because it came into general use for *Tephrosia* species in the mid- and late 1800's. During this time, *Benthamantha* Alef. (1862) and *Brittonamra* Kuntze (1891) were proposed for the species of *Cracca* Benth. *Benthamantha* Alef. created nomenclatural confusion since it achieved popularity in the years between its publication and 1930 or so. The conservation of *Cracca* Benth. (1853) over *Cracca* L. (1753) resolved the situation since *Cracca* Benth. is older than both *Benthamantha* Alef. and *Brittonamra* Kuntze.

1. **Cracca mollis** (H.B.K.) Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 9. 1853.—FIG. 14.

Tephrosia mollis H.B.K., Nov. Gen. Sp. Pl. 6: 463. 1823. TYPE: Venezuela (P, not seen; microfiche, MO). Non Valet, Bull. Dept. Agr. Indes Neerl. 10: 17. 1907. TYPE: South Africa, not seen.
Benthamantha mollis (H.B.K.) Alef., Bonplandia 10: 264. 1862.
Brittonamra caribaea fo. *micrantha* (Micheli) Kuntze, Rev. Gen. 165. 1891.
Cracca micrantha Micheli in Durand & Pittier Bull. Soc. Roy. Bot. Belgique 30: 286.
Benthamantha micrantha (Micheli) Rose, Contr. U.S. Natl. Herb. 10: 99. 1906.
B. fruticosa Rose, Contr. U.S. Natl. Herb. 10: 99. 1906. TYPE: Mexico, *Painter & Rose 10087* (US).
B. panamensis Rydb., Fl. No. Amer. 24: 244. 1924. TYPE: Panama, *Pittier 2340* (Holotype, US; isotype, NY).
B. mollis var. *micrantha* (Micheli) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 525. 1937.

Woody-based perennial *herb* or *shrub* to 2 m tall; stems more or less hairy, often with pilose or silky hairs, usually glabrescent. *Leaves* alternate, imparipinnate, leaflets (9–)11–15(–19), ovate or elliptic, rounded at the base, rounded and mucronate at the apex, 6–45 mm long, 4–16 mm wide, mature leaflets averaging 25 mm long, 12 mm wide, larger towards the leaf apex, pubescent on both sides, hairs longer, denser and paler beneath; rachis hairy, to ca. 8 cm long; stipels linear, to 1.5 mm long, stipules linear, apparently deciduous, to 6 mm long. *Inflorescence* shorter than the leaves, of 2–6-flowered axillary racemes, bracts linear, apparently deciduous, ca. 1 mm long, subtending a single pedicel 1.5–3.0 mm long. *Flowers* with hypanthium campanulate, ca. 7 mm long, pubescent, the teeth narrow triangular to acuminate, ca. 4 mm long; petals to 9 mm long, the standard pale pink, apparently usually with darker, purplish stripes, pubescent outside, the wings purplish, glabrous, the keel light yellowish green, glabrous; stamens diadelphous, 10; ovary sessile, linear, the distal ½ of the style hairy, the stigma capitate. *Fruit* linear to oblong, to ca. 7 cm long, ca. 3 mm wide, pubescent or glabrous outside, regularly septate within to form square chambers, flattened and indented between the seeds outside, the style base persistent, 2-valved, the valves twisting on dehiscence, many-seeded; seeds compressed and approximately square, with rounded corners, 1–2 mm long, dark, glabrous.

Cracca mollis (H.B.K.) Benth. & Oerst. is found from Mexico to Ecuador and Venezuela. In Panama it is a more or less weedy plant of dry or disturbed forest.

According to the ranges stated by Rydberg (1924), four species of *Cracca* Benth. occur in Panama: *Cracca ochraleuca* (Jacq.) Benth. ("Peru to Panama");

FIGURE 14. *Cracca mollis* (H.B.K.) Benth. & Oerst.—A. Habit (×4/5).—B. Flower with one wing petal removed (×3 1/5).—C. Wing petal (×3 1/5).

Cracca mollis (H.B.K.) Benth. ("Yucatan . . . south to Ecuador and Venezuela"); *Cracca caribaea* (Jacq.) Benth. ("Hispaniola; Porto Rico; Lesser Antilles; Panama; also in northern South America"); and *Benthamantha panamensis* Rydb. (known only from the type locality in Panama). *Cracca ochraleuca* can be distinguished by the relatively few leaflets (5–7; sometimes 9). *Cracca caribaea* can be distinguished by the relatively large number of leaflets (11–25), the long inflorescences (4–6 cm long, occasionally shorter), and the relatively large corolla (ca. 10–14 mm long). None of the collections from Panama that I have seen average either as few leaflets as *C. ochraleuca* or as many as *C. caribaea*. None of the Panamanian collections have inflorescences or corollas as long as the dimensions given above for *C. caribaea*. Although I have not seen a type collection of *C. caribaea*, the characters cited above agree well with Jacquin's plate. Both *C. ochraleuca* and *C. caribaea* appear to be good species, but neither is among the collections from Panama reviewed here.

Rydberg's (1924) key to species of *Benthamantha* concerns pod pubescence: the pods of *B. panamensis* are glabrous (the phrase "or slightly granuliferous" is added in the species description), while those of *Cracca mollis* are pubescent ("puberulent" in the species description). Reading Rydberg's full descriptions adds the following points of difference: *Benthamantha panamensis* has stems to 30 cm or more; stipules 3–5 mm long; leaves 5–8 cm long; leaflets 11–15; leaflets 1.0–2.5 cm long; stipels 1 mm long; bracts 5 mm long; calyx lobes 4–5 mm long. *Cracca mollis*, according to Rydberg, has stems to 2 m tall; stipules 4–8 mm long; leaves to 5 cm long; leaflets 7–13, 1–4 cm long; stipels minute; bracts 3 mm long; calyx lobes 3–4 mm long. Resolution of the difference between these two species depends on examination of the type material of *Cracca mollis*, unavailable for the current study, and additional collections of *Benthamantha panamensis* which is now known only from the type collections. The collections of *Cracca* Benth. from Panama, although showing some variability perhaps due to age or habitat, are so generally similar to warrant treatment as one species. The pubescence of the pod, present in some Panamanian collections and not in others, is not regarded as a significant character at the species level. Provisionally, then, *Benthamantha panamensis* Rydb. is treated as a synonym of *Cracca mollis* (Jacq.) Benth.

CANAL ZONE: Madden Forest, *Croat 12901* (MO). Madden Dam, 50 ft, *Lewis et al. 3, 25* (both MO); *Porter et al. 4003* (MO). CHIRIQUÍ: Quebrada Mellize, 0–150 m, *Liesner 426* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5235* (MO, SCZ), *5244* (SCZ). PANAMÁ: Sabanas, *Paul 453* (US). Alhajuela, *Pittier 2340* (NY, US; the specimens bear different dates). Población de Chame, *Taylor 92* (PMA).

15. CROTALARIA

Donald R. Windler and Leo McLaughlin[29]

Crotalaria L. Sp. Pl. 714. 1753; Gen. Pl., ed. 5. 320. 1754. TYPE: *C. lotifolia* L. (see Polhill, 1968).

Herbs or shrubs, erect to prostrate. *Leaves* ternately compound or unifoliolate by reduction; leaflets entire, glabrous or pubescent, subtended by stipules; stip-

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ules varying greatly in size and shape. *Inflorescences* racemes, peduncles terminal or opposite leaves, bracts setaceous to foliaceous; bracteoles paired, similar in shape to the bracts and located on the pedicel or the calyx. *Flowers* sometimes showy, bisexual, 5-merous; calyx green, the bilabiate tube usually campanulate, glabrous or pubescent, the lobes usually longer to much longer than the tube; corolla papilionaceous, usually yellow (blue in *C. verrucosa*), standards orbicular or obovate, the apex rounded or retuse, the base clawed, the adaxial surface and veins near the base frequently becoming red-tinged, the wing petals oblong, attached to a stalk continuous with the lower margin (cleaver-shaped), the blades usually puckered between some of the veins, the keel petals usually twisted at the tip, lanate ciliate; stamens 10, monadelphous, the staminal tube open on the upper side, the anthers dimorphic with basifixed long anthers alternating with medifixed short anthers, the short anthers positioned above the elongate at anthesis; ovary terminated by a geniculate style. *Fruit* an inflated, sub-cylindric, sessile or short stipitate legume, glabrous or pubescent, the fruits of some species becoming black at maturity; seeds 7–46 per legume, oblique cordiform, the testa smooth and usually impervious to water.

Crotalaria is a genus of about 550 species, over 400 of which occur in Africa and about 70 of which appear to grow naturally in the New World. Polhill (1968) published a reorganization of sections in the genus based on floral morphology. Panamanian plants fall into five of Polhill's sections: *Calycinae*—*C. pilosa, C. rotundifolia, C. sagittalis*; *Crotalaria*—*C. longirostrata, C. retusa, C. spectabilis, C. verrucosa*; *Incanae*—*C. incana*; *Stipulosae*—*C. cajanifolia, C. maypurensis,* and *C. micans*.

Some species of *Crotalaria* have been used as cover crops and green manure crops in tropical countries. *Crotalaria juncea*, the sunnhemp of India, used for its fiber content, is probably the most economically important member of the genus. Monocrotaline, an alkaloid isolated from *C. spectabilis* has been shown to be active as a cancer retardant. A few species have been used as ornamentals and the young shoots and leaves of a few species have been used as pot herbs. Ingestion of mature *Crotalaria* tissue has been shown to be toxic due to the alkaloids which it contains. These alkaloids cause such symptoms as lesions in the heart, liver and kidneys, mast cells in the lungs, pulmonary hypertension, and heart failure.

Although no specimens of *Crotalaria pumila* Ortega have been observed from Panama, this weedy species should be expected. Collections of *C. pumila* are known from the United States, Mexico, Guatemala, Belize, Honduras, Nicaragua, Venezuela, Ecuador, Peru, Brazil, Bolivia, and Argentina. The species is a variable low growing, less than 0.6 m tall, trifoliolate herb which has small flowers, usually less than 10 mm long, with an elongated keel. It most closely resembles the larger, woody *C. longirostrata*. The two species can usually be separated on the basis of plant size: *C. pumila* 0.05–0.60 m tall, *C. longirostrata*—0.7–3.0 m tall.

Literature

Polhill, R. 1968. Miscellaneous notes on African species of *Crotalaria* L., II. Kew Bull. 22: 169–348.

Senn, H. A. 1939. The North American species of *Crotalaria*. Rhodora 41: 317–367.

Windler, D. R. 1974. A systematic treatment of the native unifoliolate Crotalarias of North America. Rhodora 76: 151–204.

a. Leaves unifoliolate.
  b. Leaves broadly rhombic or ovate; stipules crescent shaped; stems ridged; flowers blue or white and violet ---------- 11. *C. verrucosa*
  bb. Leaves not rhombic or ovate; stipules other than crescent shaped; stems terete; flowers yellow.
    c. Leaves oblanceolate; bracteoles attached to the pedicel; calyx glabrous or strigulose; fruits brown at maturity.
      d. Stipules and bracts persistent, ovate, 0.5–1.5 cm long; calyx glabrous ---- 10. *C. spectabilis*
      dd. Stipules and bracts caducous, narrow, 0.2–0.3 cm long; calyx strigulose ---------- 7. *C. retusa*
    cc. Leaves elliptic, lanceolate, or narrowly lanceolate; bracteoles attached to the calyx; calyx not glabrous; fruits black at maturity.
      e. Stipules decurrent for more than one internode; inflorescence terminal -- 6. *C. pilosa*
      ee. Stipules decurrent for less than one internode; inflorescences leaf opposed.
        f. Plants erect ---------- 9. *C. sagittalis*
        ff. Plant decumbent or prostrate ---------- 8. *C. rotundifolia*

aa. Leaves trifoliolate.
  g. Inflorescences leaf opposed; stems usually terete ---------- 1. *C. cajanifolia*
  gg. Inflorescences terminal or appearing so; stems usually striate.
    h. Petiole equal to or longer than the terminal leaflet; calyx lobes more than twice as long as the tube; bracteole at the junction of the pedicel and the calyx; fruits villous, trichomes often to 2.0 mm long ---------- 2. *C. incana*
    hh. Petiole shorter than the terminal leaflet; calyx lobes less than twice as long as the tube; bracteole attached to the pedicel; fruits strigulose, trichomes usually less than 0.5 mm long.
      i. Calyx lobes nearly twice as long as the tube; standard 1.4–1.9 cm long (measured from the base of the calyx to the apex of the standard in the closed flower); keel not prolonged, bearing a cluster of trichomes on the external surface; fruit usually longer than 3 cm.
        j. Inflorescences crowded, usually with a tuft of curved bracts at the apex ---------- 5. *C. micans*
        jj. Inflorescences lax, lacking a tuft of curved bracts at apex ---------- 4. *C. maypurensis*
      ii. Calyx lobes about the same length as the tube; standard 1.3 cm or less; keel long attenuate no trichomes present on the external surface of the keel; fruit less than 3 cm long ---------- 3. *C. longirostrata*

1. **Crotalaria cajanifolia** H.B.K., Nov. Gen. Sp. Pl. 6: 405, 1824. TYPE: Mexico: "in declivate montes Jorullo," 1050 m, *Humboldt & Bonpland* (P).

C. poeppigii Presl., Botanische Bemerk. 123. 1844. TYPE: Cuba: "In convallibus humidis Cubae ad Sumidaro," *Poeppig 6121* (M).

C. guatemalensis Benth., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1–2: 2., 1853. TYPE: Guatemala, *Friedrichsthal* (K).

C. carmioli Polak., Linnaea 41: 558. 1877. TYPE: Costa Rica, *Polakowsky 306* (B, not seen; photo F).

C. vitellina var. *schippi* Senn, Rhodora 41: 364. 1939. TYPE: British Honduras, Stann Creek, along sea beach, *Schipp 493* (holotype, GH, isotypes A, NY).

Herb, shrub, or *small tree* to 3 m tall; stem terete, strigulose. *Leaves* trifoliolate, the terminal leaflet elliptic or elliptic lanceolate, apex acute or acuminate, the base cuneate, 3.3–8.0 cm long, 1.0–3.3 cm broad, the margins entire, above

glabrous, beneath strigulose, veins 7–11 on each side of the midvein, lateral leaflets similar but slightly smaller; petiole 2.0–6.3 cm long; stipules linear triangular, ca. 1.0 mm long, persistent. *Inflorescences* leaf-opposed racemes bearing 20–36 flowers; bracts linear triangular, 1.0–1.7 mm long, persistent; pedicels 4.0–5.0 mm long; bracteoles absent or represented by a barely visible lobe above mid-pedicel. *Flowers* yellow, 9–11 mm long; calyx 8–9 mm long, the tube campanulate, the lobes about twice as long as the tube, strigulose; corolla yellow, occasionally tinged with purple, 7.0–9.5 mm long, the standard 7.0–9.5 mm long, 7–10 mm broad, retuse, the wings 6–8 mm long, the claws 1.5–2.5 mm long, oblong or elliptic, oblique, the keel 2.4 mm long, the short anthers 0.6–0.9 mm long; style with a pubescent stigma, curved geniculate, 6–8 mm long. *Legume* inflated, 1.3–2.3 cm long, strigulose, brown at maturity; seeds ca. 16, green or brown, oblique cordiform, to 3.8 mm long.

Crotalaria cajanifolia is a native New World weedy species occurring in Mexico, Central America, and locally in Cuba. In Panama, the species inhabits savannas, cultivated fields and waste places. It is characterized by its leaf-opposed inflorescences, small fruits and extremely small or absent bracteoles.

Senn treated this species as a part of the South American *C. vitellina*, a view not accepted here.

Standley (1928) gave the Panamanian common name "*zapatito del obispo*" for this species. He also pointed out that the young shoots of this and related species are a popular vegetable in Salvador, being cooked like spinach. One specimen, *Aviles 13* cited "*Pito*" as a common name.

CANAL ZONE: Barro Colorado Island, *Aviles 13* (F, MO). TTC Albrook tower, Fort Clayton, *Blum 1941* (FSU, MO, SCZ). Farfan Beach, from Thatcher Highway to Palo Seco, *Burch et al. 1402* (GH, NY). Near Summit Naval Radio Station, *Croat 12535* (F, MO, NY, SCZ). Ft. Kobbe, Farfan Beach, *D'Arcy 1651* (MO). Near La Chorrera, *D'Arcy 9433* (BALT, MO). Thatcher Ferry Road, *Duke 5758A* (MO). Albrook site, Tropic Test Center, *Dwyer 6607* (SCZ). Paraiso, *Dwyer 7161* (MO). Albrook, *Dwyer & Robyns 115* (MO). Road K-19, 2 mi from W border of Canal Zone to cleared area near Canal, *Gentry 1787* (DUKE, GH, MO, SCZ). Between Summit and Gamboa, *Greenman & Greenman 5252* (MO). Cerro Ancón, *Heriberto 135* (GH); *Killip 3034* (US), *12084* (GH). Curundú, *Kozlovsky & Sawyer* (WIS). 1 mi S of Summit Gardens, *Lazor & Blum 5345* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5682* (MO). Madden Dam, *Lewis et al. 10* (GH, MO). K-2 road vicinity of Contractors Hill, *Lewis et al. 2868* (DUKE, MO, NY). Panamerican Highway, ½ km E of Canal Zone border at Araijan, *Nee 7166* (DUKE, FSU, GH, MO). W side of Summit Gardens, *Nee 7559* (FSU, GH, MO). Sosa Hill, Balboa, *Standley 26415* (A). Ancón Hill, *Standley 3034* (MO). 2 mi N Cocolí, *Tyson 1630* (FSU, MO, SCZ). Farfan Beach area, *Tyson 1830* (FSU, MO). Albrook Field, *Tyson* (SCZ). Pipeline Road, *Wilbur & Teeri 13393* (DUKE). CHIRIQUÍ: Alanje, *Castillo 07* (MO). COCLÉ: El Valle, *Dwyer 1813* (FSU, MO). Panamerican Highway, 178 km W of Panama City, *Folsom 6896* (MO). El Valle de Antón, *Garcia 5* (F, MO, PMA); *Lezcano 11* (MO). 10 mi E of Natá at Río Grande, *Tyson 5268* (FSU), *5274* (DUKE, FSU, GH, PMA, SCZ). COLÓN: Near Salamanca, 8 mi E of Transisthmian Highway, *Gentry 6708* (F, MO). Quebrada Bonita on road to Rojas 2 km NW of Salamanca, *Nee 9118* (FSU, GH, MO, NY). Santa Rita Ridge ca. 7 mi from Transisthmian Highway, *Wilbur et al. 15065* (DUKE). HERRERA: Chitré, *Allen 1093* (MO). 4 mi S Los Pozos, *Tyson 2687* (FSU, MO, SCZ). PANAMÁ: Just outside Canal Zone vicinity of TTC Albrook Tower, *Blum 1859* (FSU, PMA). A orillas de la carretera que va a la cantera de la Zona del Canal, *Correa 2012* (MO). Cerro Campana, *Croat 12029* (F, NY, SCZ). Chilibre, *Dwyer 11968* (MO). First bend of Río Pasiga, *Gentry 2377* (MO). Cerro Azul, *Jaen 39* (DUKE, MO). Corozal Road near Panamá, *Standley 26864* (GH). Entrada Urbanización Chanis, *Taylor 67* (PMA). 2 mi S of Tocumen Airport, *Tyson & Clewell 5932* (BALT, SCZ). VERAGUAS: Camino hacia La Yeguada, *Carrasquilla et al.* (MO, PMA). Río Santa María along road to Santiago, 5 km S of Santa Fé, *Nee 8117* (DUKE, MO). Puerto Mutis, 12 mi S of Santiago, *Tyson 5195* (FSU, MO, SCZ). Without locality: *Hayes 17* (NY).

FIGURE 15. *Crotalaria incana* L.—A. Habit (×½). [After *Pringle 8282*.]—B. Flower (×2½).—C. Corolla.—C¹. Standard (×2).—C². Wing petal (×2).—C³. Keel petal (×2).—D. Stamens (×3).—E. Anthers.—E¹. Large anther (×15).—E². Small anther (×15).—F. Pistil (×3). [After *Mendez 113*.]—G. Seed (×4). [After *Pringle 8282*.]

2. **Crotalaria incana** L.,[30] Sp. Pl. 716. 1753. TYPE: Lectotype, Jamaica, Herbarium Sloane, Vol. 6, fol. 6 (BM).—FIG. 15.

Crotalaria purpurescens Lam., Encyl. Méth. Bot. 2: 200. 1786 (fide Baker, 1914). TYPE: Madagascar, collector unknown (P-LAM).

[30] Additional synonyms are provided by Senn (1939).

C. pubescens Moench., Encyl. Méth. Bot. 161. 1794. Superfluous when published. TYPE: Not seen.
C. glabrescens Andersson, Kongl. Svenska. Vetensk. Acad. Handl. 1853: 248. 1855, non Benth., 1843. TYPE: Galapagos, locis graminosis regionis mediae insulae Chatham, *Andersson 222* (P).
C. picensis Philippi, Anales Mus. Nac. Montevideo 13, 1891. TYPE: Chile: Pica, ? *Philippi II 1885* (SGO 39857).

Herb or *small shrub*, less than 1 m (−2 m) tall, stem terete, puberulous to pilose. *Leaves* trifoliolate, the terminal leaflets elliptic or obovate, apex rounded, mucronate or mucronulate, the base cuneate 1.8–6.0 cm long, 1.1–3.7 cm broad, the margins entire, above glabrous, strigose or pilose, beneath glabrous to pilose or villous, the veins 6–9 on each side of the midvein, the lateral leaflets similar, but slightly smaller; petiole 2–7 cm long; stipules caducous. *Inflorescences* terminal or sub-terminal racemes bearing 7–11 flowers; bracts setaceous and curly, deciduous before anthesis; pedicels 1.8–2.0 mm long; bracteoles narrowly triangular ca. 2 mm long, pilose, located on the top of the pedicel, caducous. *Flowers* yellow, 11–15 mm long; calyx 7.5–10.0 mm long, the tube campanulate, the lobes 2.5–3.0 times as long as the tube, pilose; corolla yellow, 10–13 mm long, the standard 11–14 mm long, 10–13 mm broad, retuse, the wings 10–13 mm long, the claws 1.5–1.9 mm long, oblong, oblique, the keel 12 mm long, the non-twisted beak short; stamens dimorphic, the long anthers 1.3–1.8 mm long, the short anthers 0.5–0.6 mm long; style with pubescent stigma, geniculate, 7.0–8.3 mm long. *Legume* inflated, 2.5–3.5 cm long, pilose, brown at maturity; seeds ca. 33, brown, oblique cordiform, to 3.0 mm long.

Crotalaria incana is a common tropical weed inhabiting cultivated fields, roadsides, and waste places. It is characterized by its short calyx tube and long lobes and its pilose to villous fruits. Leaflets on this species are frequently folded at pressing time, a character not shared with other Panamanian species.

Standley (1928) listed "frijolillo" as the only Panamanian common name for *C. incana*, but he reported five common names for the species in Salvador: "*chinchin*," "*chipilin macho*," "*chipilin*," "*chilpilin de zope*," and "*chilpilin de venado*."

BOCAS DEL TORO: Bocas, along runway, *Lazor et al. 2433* (FSU). CANAL ZONE: Culebra Island, *Duke 4619* (MO). Gatún, *Cowell 312* (NY). Farfan Beach, *Blum & Godfrey 1678* (FSU, SCZ). Howard Air Force Base near Red Devil drop zone, *Tyson 1852* (MO, SCZ). La Boca, *Mori & Kallunki 3679* (MO). Miraflores Locks area, *Tyson 1602* (FSU, SCZ). Panama City, *Macbride 2623* (F); *Mendez 113* (MO). Near Playa Venado, *Wilbur & Teeri 1297* (DUKE). HERRERA: Salinas de Chitré, *Croat 9689* (MO, NY); *D'Arcy & Croat 4161* (MO). SAN SANTOS: 7 mi S of Chitré, *Croat 9702* (MO). Santa Ana, *Duke 12474* (MO, NY). PANAMÁ: Nueva Gorgona near beach, *Duke 4501* (MO). Taboga Island, *Allen 142* (GH); *Dwyer 2814* (FSU, MO); *Hunter & Allen 142* (MO).

3. **Crotalaria longirostrata** Hook. & Arnott, Bot. Beech. Voy. 6: 285. 1838. TYPE: Mexico, Talisco (Jalisco), *Lay & Collie* (holotype K).

Shrub or *small tree* to 2 m tall, stem terete, strongly striate when young. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic, the apex rounded or mucronulate, the base cuneate, 3.0–3.8 cm long, 0.7–1.0 cm broad, entire, above glabrous, beneath strigulose, the veins 8–10 on each side of the midvein, faintly visible, lateral leaflets similar but slightly smaller; petiole 1.5–3.0 cm long; stipules narrowly triangular, ca. 1.5 mm long. *Inflorescences* terminal racemes bearing 15–20 flowers; bracts narrowly triangular, 1.6–2.5 mm long, caducous; pedicels

4–5 mm long; bracteoles linear triangular, ca. 1 mm long, strigulose, located near the top of the pedicel. *Flowers* yellow, 11–14 mm long, calyx 6.0–6.5 mm long, the tube truncate, the lobes about as long as the tube, strigulose; corolla yellow or occasionally tinged with maroon, 10–13 mm long, the standard 10–15 mm long, 11–15.5 mm broad, retuse, the wings 9–11 mm long, the claws 1.5–2.0 mm long, oblong-elliptic oblique, the keel 12–13 mm long, the twisted beak strongly prolonged; stamens dimorphic, the long anthers 1.6–2.2 mm long, the short anthers 0.5–0.7 mm long; style with a pubescent stigma, sharply geniculate, 10–11 mm long. *Legume* inflated, 1.8–2.5 cm long, strigulose, brown at maturity; seeds ca. 16, beige to brown, oblique cordiform, to 3.2 mm long.

Crotalaria longirostrata is native to Mexico and Central America. The species, which is not common in Panama, occurs in grasslands, scrub-grasslands or open oak-pine forests. The species is characterized by its terminal inflorescence, short lobed calyx and its attenuated keel. *Crotalaria longirostrata* is most closely related to the herbaceous *C. pumila,* which is generally smaller in most characteristics and which appears to intergrade with it over part of its range. *C. pumila* is to be expected in Panama, but no specimens have thus far been observed.

The following local names are reported for the species in Central America: *Chipil, Chipilin, Chipilino, Parrajachel. Crotalaria longirostrata* is often sold in the markets as a pot herb. In El Salvador "The young growth and flowers are used in soup or folded into eggs. The plants are also said to be a sedative and the leaves used as a purgative or vomitive" (*Williams & Molina 9080* (MO)).

CHIRIQUÍ: Boquete, *Beliz 237* (MO); *Blum & Dwyer 2552* (FSU, SCZ). Callejon Seco, Volcán de Chiriquí, *Woodson & Schery 496* (GH, MO). Finca Lérida to Boquete, *Woodson et al. 1112* (GH).

4. **Crotalaria maypurensis** H.B.K., Nov. Gen. Sp. Pl. 6: 403. 1824. TYPE: Maypure, "Specimen in very bad condition" (*Inflorescence only,* P).

C. leptophylla Benth., Ann. Nat. Hist. 3: 430. 1839. TYPE: Br. Guiana, Savannahs of the Rupunoony, *Schomburgk 788* (K).

Shrub or *suffrutescent herb* to 1.5 m tall, stem striate, strigulose. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic to elliptic, the apex acute, acuminate or mucronulate, the base cuneate, 4.5–5.5 cm long, 1.1–1.5 cm broad, the margins entire, above glabrous, beneath sparsely strigulose, the veins 8–10 on each side of the midvein, the lateral leaflets similar, but slightly smaller; petiole 3–4 cm long, the stipules absent. *Inflorescences* terminal, lax racemes bearing up to 20 flowers; bracts linear triangular, 1–2 mm long, caducous; pedicels 5–6 mm long; bracteoles linear, 1 mm long, strigulose, located at the base of the calyx tube, caducous. *Flowers* yellow, 15–18 mm long; calyx 8–9 mm long, the tube truncate, the lobes about 1.5 times as long as the tube, strigulose; corolla yellow or tinged with violet, 15–18 mm long, the standard 13–14.5 mm long, 14.0–15.5 mm broad, retuse, the wings 13–14 mm long, the claws 2–3 mm long, oblong obovate, oblique, the keel 14–15 mm long, the non-twisted beak prolonged; stamens dimorphic, the long anthers 3.3–3.5 mm long, the short anthers 0.7–0.8 mm long; style with a pubescent stigma, curved geniculate, 9.5–12.0 mm long. *Le-*

gume inflated, 2.5–3.1 cm long, strigulose; seeds ca. 20, brown, oblique cordiform, to 3.0 mm long.

Crotalaria maypurensis is native in South America and reaches its northernmost locality in Panama. This species inhabits open situations at low elevations. It is characterized by terminal inflorescences on which the flowers are loosely arranged, by it general lack of stipules, and its short caducous bracts and bracteoles.

Senn (1939) used this name to apply to *C. acapulcensis*, a Mexican species which is similar, but differs from it in having distinct falcate stipules consistently present.

VERAGUAS: Ca. 5 mi NE of La Mesa, *Blum & Tyson 666* (FSU, MO, SCZ).

5. **Crotalaria micans** Link, Enum. Pl. Hort. Reg. Bot. Berol., Part 2: 228. 1822. TYPE: *Herb., Willd.*, America Meridionalis, *Humboldt 2172* (B-Willd. 13272, not seen; photo BALT).

C. anagyroides H.B.K., Nov. Gen. Sp. Pl. 6: 404. 1924. TYPE: Venezuela: prope Caracas, 470 hex (920 m) ?*Humboldt 598* (P).
C. dombeyana DC., Prodr., 2: 132. 1825. TYPE: *Dombey* (P, sheet 20/76).
C. stipulata Vell., Fl. Flum. 7: 307, 1825. TYPE: not seen, fide Sampaio e Peckolt, Arq. Mus. Nac. Rio de Janeiro 37: 331–394. 1943.
C. triphylla Vell., Fl. Flum. 7: 307. 1825. TYPE: not seen, fide Sampaio e Peckolt, Arq. Mus. Nac. Rio de Janeiro 37: 331–394. 1943.
C. brachystachys Benth., Linnaea 22: 512. TYPE: LECTOTYPE: Brazil, Ad Caldas in Minas Gerais, *Regnell 76* (K).

Shrub or *suffrutescent herb* to 3 m tall, stem striate, strigulose. *Leaves* trifoliolate, the terminal leaflets narrowly elliptic to elliptic, apex acute, acuminate or mucronulate, the base cuneate, 4.5–7.1 cm long, 1.4–2.7 cm broad, the margins entire, above glabrous, beneath strigulose, the veins 7–16 on each side of the midvein, lateral leaflets similar, but slightly smaller; petiole 2.5–5.0 cm long; stipules linear triangular, ca. 4.0 mm long, frequently absent. *Inflorescences* terminal racemes, bearing 15–30 flowers; bracts linear, 7–10 mm long, caducous; pedicels 5–9 mm long; bracteoles linear, 6–10 mm long, strigulose, located just above mid-pedicel, caducous. *Flowers* yellow 12–18 mm long, calyx 10–13 mm long, the tube campanulate, the lobes 1.5–2.0 times as long as the tube, strigulose; corolla yellow, with purple veins, 14–18 mm long, the standard 13–14 mm long, 18–21 mm broad, retuse, the wings 12–15 mm long, the claws 3.0–3.8 mm long, oblong, oblique, the keel 13–15 mm long, the non-twisted beak short, stamens dimorphic, the long anthers 2.8–3.1 mm long, the short anthers 0.5–0.7 mm long; style with a pubescent stigma, curved geniculate, 8.5–9.0 mm long. *Legume* inflated, 3.2–3.5 cm long, strigulose, brown at maturity; seeds ca. 20, tan to brown, oblique cordiform, to 3.5 mm long.

Prior to this publication, this species has been treated as *C. anagyroides* by Senn (1939) and others.

Crotalaria micans occurs locally in Mexico, Central America, South America and the West Indies. This species inhabits savannas and other open situations. It is characterized by terminal inflorescences on which the large flowers are

grouped tightly, by its long curled bracts and bracteoles which are prominent among the buds and by its fruit size. It is most closely related to *C. maypurensis*, which has lax inflorescences and lacks the tuft of curled bracts.

One specimen, *Tyson 5676*, reports that this species is used as an ornamental.

CANAL ZONE: Old cement foundation, Summit Garden, *Nee 7308* (MO). Without other locality, *Cotterman & Klawe P-3* (MO). CHIRIQUÍ: 1 mi SW of Cerro Punta, *Tyson 5676* (FSU, MO, SCZ). Cultivated, Volcán, Escuela Agricola San Benito, *Croat 16187* (MO). Road from Volcán to Río Serano, 12 km from Escuela San Benito in Volcán, *Croat 26500* (MO). North side of Cerro Pando, *D'Arcy 6632* (BALT, MO). Near Lagunas, *D'Arcy 10,053* (BALT, MO). PANAMÁ: Entrada a Cerro Azul, *Carrera 15* (MO). Cerro Azul frente a la entrada del Colegio de la Santa Familia, *Reece 3* (DUKE, MO). Lava field ½ mi from El Hato de Volcán, *Wilbur et al. 11932* (DUKE). VERAGUAS: road between Laguna La Yeguada and Calobre, *Luteyn 1470* (DUKE, MO, NY). 5 mi NE of La Mesa, *Blum & Tyson 666* (MO).

6. **Crotalaria pilosa** Mill., Garden. Dict. No. 2, 1768, non Thunb., 1800. non Roxb. 1820. TYPE: *Houstoun*, "Vera Cruz in New Spain" (BM).—FIG. 16A–B.

C. pterocaula Desv., J. Bot. (Desvaux) 3: 76. 1814. TYPE: Habitat in America calidore *Desvaux* (P).

C. genistella H.B.K. Nov. Gen. Sp. Pl. 6: 398. 1824. TYPE: Crescit locis siccis, in Audibus Popayanensium, inter La Sequia et Almaguer, prope villam San Miquel et in ripa fluminis Putes, alt. 807, item prope Mariquitam Novo Granatensium alt. 400 hex. *Humboldt 2050* (P).

C. hexaptera Schrank, Syll. Ratisb. 2: 73. 1824, 1828. TYPE: Brazil: "Colitur in Caldario" *Martius*. Note: One specimen was located at Munich, *Martius 1609*, but the epithet *hexaptera* was not attached (Letter from Dr. Schreiber at M).

Crotalaria pterocaula var. *genistella* (H.B.K.) Benth. in Mart., Fl. Bras. 15: 20. 1859. TYPE: same as for *C. genistella*.

Crotalaria pilosa var. *skutchii* Senn, Rhodora 41:331. 1939. TYPE: Costa Rica: Prov. San Jose, El General, 730 m, *Skutch 3071* (GH).

Herb less than 1 m tall, the stem winged by decurrent stipules, strigose to pilose. *Leaves* unifoliolate, elliptic, lanceolate, narrowly lanceolate or linear, the apex acute or mucronulate, the base rounded to cuneate, 2.0–6.7 cm long, 3.5–15.0 mm broad, the margins entire, above glabrous or strigose to pilose, beneath strigose to pilose, the veins not evident; petiole 1.5 mm or less long; stipules inverted sagittate, winging the stem for more than one internode, causing the stem to appear continuously winged, the wings 0.5–1.0 cm broad, the nodal lobes 3–10 mm long. *Inflorescences* terminal or leaf opposed and terminal racemes, bearing 8–20 flowers; bracts linear or subulate, 3.1–4.0 mm long, persistent; pedicels 3.5–6.0 mm long; bracteoles narrowly elliptic or subulate, 2.5–4.5 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 9–14 mm long; calyx 9–13 mm long, the tube campanulate, the lobes 2–2.3 times as long as the tube, sericeous; corolla yellow, about 10–14 mm long, the standard 7–9 mm long, 7–12 mm broad, retuse, the wings 6–9 mm long, the claws 1.8–2.0 mm long, oblong obovate, oblique, the keel 8–12 mm long, the twisted beak short; stamens dimorphic, the long anthers 1.5–2.3 mm long, the short anthers 0.3–0.7 mm long; style with a pubescent stigma, sharply geniculate, 5.5–5.8 mm long. *Legume* inflated, 2.2–3.4 cm long, glabrous, black at maturity; seeds ca. 20, tan, brown or red brown, oblique cordiform, to 2.5 mm long.

Crotalaria pilosa is a species native to the New World occurring in Jamaica, Cuba, Central and South America. The species grows in savannas and on open

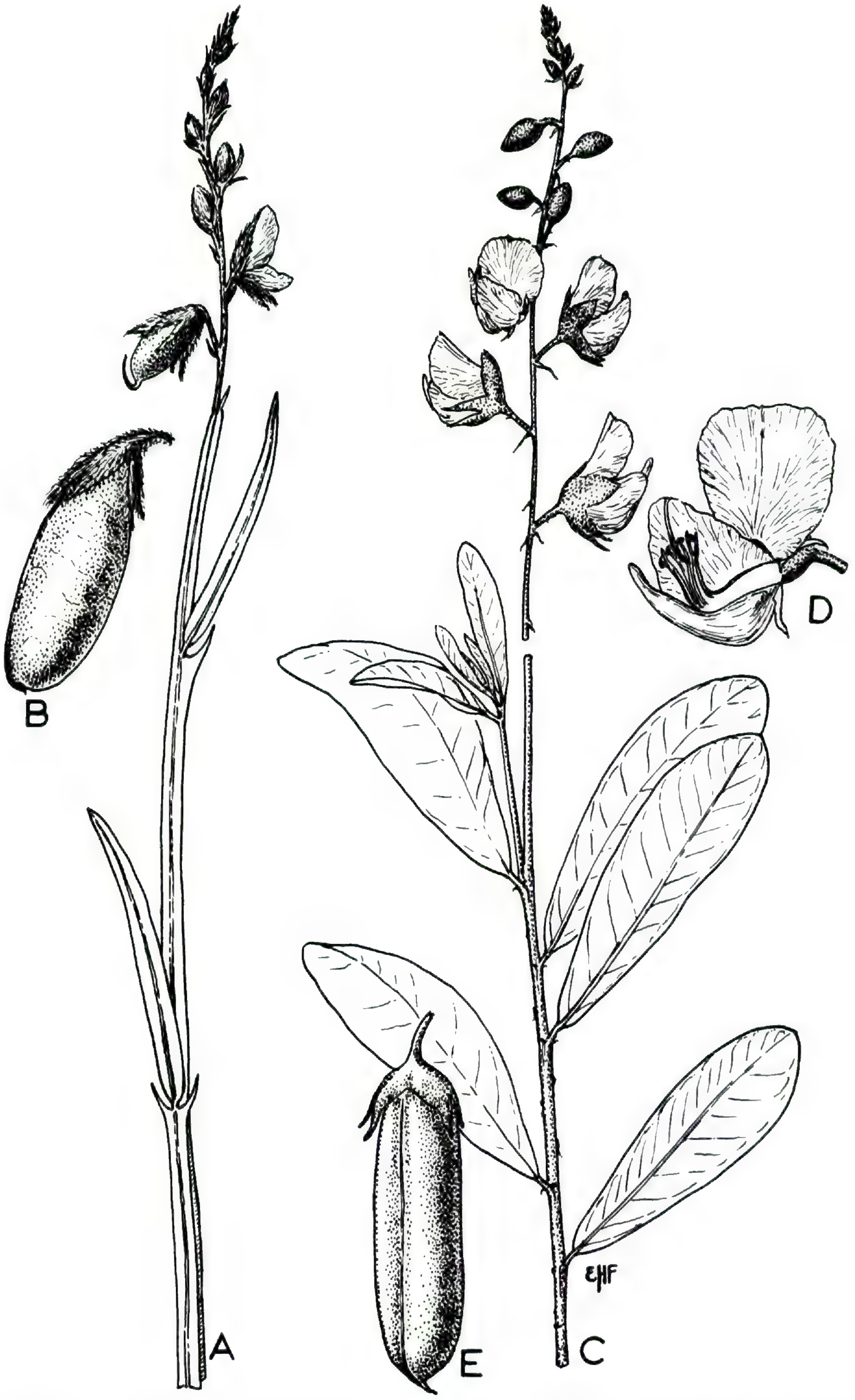

FIGURE 16. *Crotalaria*.—A–B. *Crotalaria pilosa* Mill.—A. Habit (×4/5).—B. Fruit (×1 3/5). [After *Johnston 22*.]—C–E. *Crotalaria retusa* L.—C. Habit (×4/5).—D. Flower (×1 3/5).—E. Fruit (×1 1/5).

ground. *Crotalaria pilosa* most closely resembles *C. sagittalis* in Panama, but may be easily distinguished by its terminal inflorescences and its winged stems.

The common name "Chiba-Chiba" was cited for this species on one specimen, *Sucre 138*. Standley (1928) cited the local name "frijolillo" for this species, but pointed out that the name is used for many species in the family.

CANAL ZONE: Ancón Hill, *Killip 12075* (GH); *Standley 25202* (US); *Standley 26357* (GH, US). Miraflores Lake near Navy Depot sign nearest to island, *White 170* (MO, US). CHIRIQUÍ: Boquete, *Terry 1266* (GH). COLÓN: Tocumen Airport, *Dwyer 3103* (GH). DARIÉN: Near Vera Cruz, *Duke 6027* (MO). HERRERA: Road between Las Minas and Pesé, *Duke 12305* (MO, NY). Ocú, *Ebinger 1078* (GH, MO); *Tyson et al. 2880* (MO, SCZ). Roadside El Potrero and Las Minas, *D'Arcy & Croat 4150* (MO); *Burch et al. 1332* (GH, MO, US). PANAMÁ: Near Arraijan, *Woodson et al. 1403* (GH, US). Cerro Campana, *D'Arcy 9579a* (BALT, MO); *Ebinger 928* (GH); *Croat 12167* (MO). Near Río Pacora and Chepo Highway, *Duke 5903* (MO); *Nee 6866* (DUKE, MO, US); *Tyson et al. 2343* (SCZ). Between Matías Hernández and Juan Díaz, *Standley 32079* (US). Pacora, *Allen 998* (MO). Between Río Pacora and Chepo, *Porter et al. 5157* (MO). Taboga Island, *Standley 28000* (US). Without other locality, *Jorgensen 3206* (MO); *Sucre 138* (RB). San Jose Island, *Johnston 22* (GH, US). LOS SANTOS: Los Asientos, *Wendehake 34* (PMA). WITHOUT LOCALITY: Canafistula, *Dwyer 2466* (MO).

7. **Crotalaria retusa** L., Sp. Pl. 715. 1753. TYPE: Lectotype, Ceylon, Herbarium Herman, folio 2:21 (BM).—FIG. 16C–E.

Dolichos cunifolius Forssk., Fl. Aegypt. Arab. 134. 1775. TYPE: Arabia, *Forsskal,* Feb. 1763 (C).
Lupinus cochinchinensis Loureiro, Fl. Cochinch. 429. 1790. TYPE: Not seen, probably not preserved.
Crotalaria retusifolia Stokes, Bot. Mater. Medica 3: 516. 1812. Superfluous when published.
Crotalaria cunifolia (Forssk.) Schrank, Syll. Ratisb. 2: 78. 1828.
Crotalaria hostmanni Steudel, Flora 26: 757. 1843. TYPE: Surinam: In pasture, 1842, *Hostmann 593* (P, holotype; NY, W, isotypes).

Herb, usually less than 1 m tall, stem striate, strigulose. *Leaves* unifoliolate, oblanceolate, the apex rounded or mucronulate, the base cuneate, 3.5–9.7 cm long, 1.4–3.6 cm broad, the margins entire, above glabrous, beneath puberulent with loosely appressed trichomes, the veins 7–12 on each side of the midvein; petiole 2–3.5 mm long; stipules frequently absent at flowering time, when present narrowly angular ovate and less than 2.5 mm long. *Inflorescenses* terminal racemes, bearing 14–20 flowers, bracts narrowly triangular, to 2.5 mm long; persistent, pedicels 5–9 mm long; bracteoles narrowly triangular, 0.5–1.0 mm long, puberulent, located at mid-pedicel. *Flowers* yellow, 17–24 mm long, the calyx 12–14 mm long, the tube truncate, the lobes 1.2–1.8 times as long as the tube, strigulose; corolla yellow, occasionally with purple veins, 17–24 mm long, the standard 14–18 mm long, 17–25 mm broad, retuse, the wings 13–15 mm long, the claws 3–4 mm long, oblong lanceolate, oblique, the keel 16–18 mm long, the twisted beak not prolonged; stamens dimorphic, the long anthers 2.8–3.1 mm long, the short anthers 0.8–1.0 mm long; style with a pubescent stigma, geniculate, 11–12 mm long. *Legume* inflated, 3.0–3.8 cm long, glabrous, dark brown to black; seeds ca. 23, tan to brown, oblique cordiform, to 4.5 mm long.

Crotalaria retusa is a naturalized, wide-spread weed in the New World tropics and is the most commonly collected species of the genus in Panama. This species may be confused with *C. spectabilis*, but is readily separated by bract characters and calyx indument.

Standley (1925) lists Costa Rican common names for this species: "quiebraplato," "gallincillo," "patillo," and the Puerto Rican names "matraca" and "sonajuelas."

BOCAS DEL TORO: Depression along runway at Bocas, *Lazor et al. 2361* (BALT, FSU, MO). Columbus Island, 3 mi inland, *Wedel 22* (MO, US). Isla Colón, *Wedel 52, 507* (both GH), *2825* (GH, NY, US). CANAL ZONE: Near Fort Sherman, *Bailey & Bailey 687* (GH). Ft. Kobbe, Farfan area, *D'Arcy 9621* (MO). Frijoles, *Duke 15045* (NY); *Ebinger 80* (GH, US). Barro Colorado Island, near Frijoles dock, *Foster 582* (DUKE). Pipeline Road between mile markers 0 and 11.1, ca. 16 mi N of Gamboa, *Lewis et al. 5419* (SCZ). Balboa, *MacBride & Featherstone 33* (F). Gamboa Golf Club, *Nee 7297* (US). Near Fort Sherman, *Piper 5889* (US). Without locality, *Pittier 3860* (US). Near Fort Sherman, *Standley 31222* (MO, US); *Tyson & Blum 3784* (FSU, SCZ). Pipeline Road NW of Gamboa (ca. 6 mi) *Wilbur & Teeri 13345* (DUKE). NW of Gamboa ca. 16 mi, *Wilbur & Teeri 13401* (DUKE). Limón Bay, S of Fort Sherman, *Witherspoon & Witherspoon 8680* (MO). CHIRIQUÍ: Puerto Armuelles, *Busey 512* (DUKE). Manzanillo, 9 km SSW of Puerto Armuelles, *Busey 736* (MO, NY). Quebrado Tuco 9 mi S of Puerto Armuelles, *Croat 22090* (F, MO). Puerto Armuelles, *Woodson & Schery 813* (GH, US). COCLÉ: Panamerican Highway at Río Chico bridge ½ km S of Natá, *Nee 10771* (US). 1–5 mi S of Antón on old road to coast, *Tyson & Blum 2585* (FSU, MO, SCZ). COLÓN: María Chiquita E of Río Piedras toward Portobelo, *Dwyer & Kirkbride 7781* (GH, US). Road to Piña at mouth of Chagres River, *Kirkbride & Hayden 317* (SCZ). Nuevo Chagres, *Lewis et al. 1854* (GH, MO, US). Between Piña and Gatún, *Luteyn 1274* (DUKE, F, MO). PANAMÁ: Juan Díaz, Carretera Central, *Castillo 22* (DUKE, GH). Near Cañitas, *D'Arcy 9425* (BALT, MO). Near Pacora, *D'Arcy 9633* (BALT, MO). Between Panamá and Chepo, *Dodge et al. 16666* (GH). Between Río Pacora and Chepo, *Porter et al.* (SCZ). Taboga Island, *Standley 27973* (US). W of Chepo on road to Panama City, *Tyson 5370* (FSU, SCZ). Camino de Pacora, *Wendehake 20* (DUKE, FSU, GH, US). WITHOUT LOCALITY: Cultivated, *Heriberto 92* (US); *Gale* (SCZ).

8. **Crotalaria rotundifolia** Walt. ex. J. F. Gmelin,[31] Syst. Nat. 2: 1095. 1792.

Crotalaria angulata Senn, 1939, not Mill. 1768. TYPE: (see Windler, 1974).

Crotalaria rotundifolia var. *vulgaris* Windler, Phytologia 21: 264. 1971. TYPE: South Carolina: Hampton Co., 3 mi NW of Yemassee on S.C. Highway 68, Sandhill. *Windler & Windler 2769* (holotype: NCU).

Anonymos rotundifolia Walter, Flora Caroliniana 181, 1788. TYPE: herb. Walter (BM; photo NCU). [Anonymos Walt. not intended as generic name.]

Herb, perennial, prostrate, to 3 dm long; stem terete, sparsely sericeous, pilose. *Leaves* unifoliolate, the leaflets narrowly elliptic to lanceolate, apex acute, acuminate or mucronulate, the base rounded to cuneate, 18–25 mm long, 5–13 mm broad, the margins entire, above strigose, beneath strigose, the veins on each side of the midvein obscure; petiole 1–2 mm long; stipules absent or winging the stem for up to one cm. *Inflorescences* leaf-opposed racemes, bearing 1–3 flowers, bracts linear, 3–4 mm long; pedicels 3–4 mm long; bracteoles linear, 3–4 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 9–10 mm long; calyx 9–10 mm long, the tube campanulate, the lobes 2–3 times as long as the tube, pilose; corolla yellow with maroon veins, 9–10 mm long, the standard 4.5–6.0 mm long, 4–7 mm broad, retuse, the wings 4–5 mm long, the claws 2–2.5 mm long, oblong oblanceolate, oblique, the keel 6–7 mm long, the twisted beak short; stamens dimorphic, the long anthers 0.9–1.5 mm long, the short anthers 0.3–0.5 mm long; style with a pubescent stigma, sharply geniculate, 4.0–5.5 mm long. *Legume* inflated, 1.7–2.0 cm long, glabrous, black at maturity; seeds ca. 15, brown, oblique cordiform, to 2.5 mm long.

Panamanian plants of this species are assigned to variety *vulgaris* Windler. Herbarium specimens of this species are sometimes difficult to distinguish from specimens of *C. sagittalis,* especially when the plants are dwarfed. When growing together in good conditions, the two are separable using the following characters:

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[31] Additional synonymy is provided by Windler (1974).

C. rotundifolia is a prostrate perennial plant with a number of stems radiating from a central root stock. *C. sagittalis* is an erect annual or perennial plant with a single much branched stem. Peduncle length is also usually greater in *C. rotundifolia*.

Studies are underway to examine the relationship between *C. rotundifolia* of the S.E. United States and the plants of Mexico and Central America. This species is native to the Southern United States, Mexico and Central America. North of Panama it often inhabits well drained slopes in open pine woods.

CHIRIQUÍ: Boquete, *Lewis et al. 336* (F, SCZ). HERRERA: Without other locality, *Ebinger 1076* (US). PANAMÁ: Río Tapia, *Standley 28214* (US).

9. **Crotalaria sagittalis** L.,[32] Sp. Pl. 714. 1753. LECTOTYPE: *Kalm*, herb. Linnaeus (LINN 895.2).

Crotalaria tuerckheimii Senn var. *tuerckheimii*, Rhodora 41: 339. 1939. TYPE: Guatemala: Alta Verapaz, Coban, 1350 m, *Türckheim II 1282* (GH).

Herb or suffrutescent herb, 1–6 dm tall, the stem winged by decurrent stipules, villous. *Leaves* unifolioliate, elliptic or lanceolate, the apex obtuse, mucronate, acuminate or acute, the base rounded to cuneate, 2–5 cm long, 0.4–1.5 cm broad, the margins entire, above and beneath pilose, trichomes to 2.8 mm long, veins not evident; petiole 2 mm or less long; stipules inverted sagittate, winging the stem for one internode or less, tapering to the base, the wings 0.3–1.4 cm broad, the nodal lobes 0.4–1.5 cm long. *Inflorescences* leaf-opposed racemes bearing 1–5 flowers; bracts lanceolate to elliptic lanceolate, 4–7 mm long; pedicels 2.0–3.5 mm long; bracteoles linear to elliptic lanceolate, 2.5–6.0 mm long, pilose, located on the base of the calyx. *Flowers* yellow, 11–16 mm long, the calyx 7–11 mm long, the tube campanulate, the lobes 2.5–3.0 times as long as the tube, strigulose; corolla yellow, occasionally with maroon veins, 6–8 mm long, the standard 5.5–7.0 mm long, 4.2–5.0 mm broad, retuse, the wings 5.0–5.5 mm long, the claws 1.8–2.0 mm long, oblong, oblique, the keel 6.5–7.0 mm long; short stamens dimorphic, the long anthers 0.8–1.1 mm long, the short anthers 0.3–0.4 mm long; style with a pubescent stigma, sharply geniculate, 4.0–5.3 mm long. *Legume* inflated, 1.8–2.8 cm long, glabrous, black at maturity; seeds ca. 25, tan, olive or brown, oblique cordiform, to 2.5 mm long.

Crotalaria sagittalis is a highly variable species native to North America. Its range is from northern United States to South America, being replaced in many South American habitats by *C. stipularia* and *C. velutina*. Of the Panamanian species it is most closely related to *C. pilosa*, differing from it in inflorescence position and stipule characters, and to *C. rotundifolia*, differing from it in habit.

Some specimens of this group are difficult to place and study is under way to reexamine the variation in Mexico to determine if the plants would be better treated by the recognition of additional taxa.

Standley (1928) cited the following common names for this species: Salvador—"chinchin," "cohetillo" and "espadilla"; Guatemala—"chipilin de montana."

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[32] Additional synonyms are provided by Windler, 1974.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 117* (F). Without other locality, *Wedel 327* (GH, MO). CANAL ZONE: Contractors Hill, *Dwyer 2788* (FSU, GH, SCZ). Miraflores Locks area, *Tyson 1597* (FSU, MO, SCZ). Playa Kobbe, *Wilbur & Teeri* (DUKE, GH, MO). CHIRIQUÍ: Boquete, *Béliz 255* (MO); *D'Arcy 9780* (MO); *Davidson 598* (MO); *Woodson & Schery 789* (MO). 6.7 mi W of Boquete, on road through El Sato, *Luteyn 1493* (DUKE, US). El Hato, Llanos, *Ebinger 767* (GH, US); *Folsom et al. 7154* (MO); *Wilbur et al.* 11940 (DUKE). Nueva California, *Tyson 5716* (FSU, SCZ). Volcán, *Duke & Maxwell* 9216 (MO). HERRERA: Ocú, *Ebinger 1076* (F, MO, US). LOS SANTOS: Playa de La Concepción, *Burch et al. 1269* (MO). Los Asientos, *Wendehake 34* (MO, PMA). PANAMÁ: Río Teta, E of San Carlos at Highway 1, *Luteyn 1572* (DUKE). Tocumen, *Dwyer 1080 A, 2570* (both MO).

10. **Crotalaria spectabilis** Roth, Nov. Gen. Sp. Pl. 341. 1821. TYPE: *Benj. Heyne* ex "India Oriental," not seen.

C. sericea Retz., Obs. Bot. 5: 26. 1788. non Burm. f. (1768). TYPE: India, *Koenig* (LD).
C. leschenaultii DC., Prodr. 2: 125. 1825. TYPE: *Leschenault 176* Mts. de Nellÿgarrÿ (Ind. Orient) (G).
C. macrophylla Weinmann in Schrank, Syll. Ratisb. 2: 26. 1828. TYPE: not located.
C. altipes Raf., New Fl. N. Am. 2: 57. 1837. TYPE: Not seen, *fide* Merrill, Index Raf. 143. 1949. Description states that bracts are lanceolate so this may apply to *C. retusa* L.
C. retzius A. S. Hitch., Annual Rep. Missouri Bot. Gard. 4: 74. 1893. TYPE: India, *Koenig* (LD).

Herb or suffrutescent herb, to 2 m tall, stem terete, glabrous. *Leaves* unifoliolate, broadly angular oblanceolate or occasionally elliptic, apex rounded or mucronate, the base cuneate, 5.5–15.0 cm long, 3.5–7.5 cm broad, the margins entire, above glabrous, beneath strigulose with loosely appressed trichomes, the veins 8–12 on each side of the midvein; petiole 4–6.5 mm long; stipules triangular, 4.5–9.0 mm long. *Inflorescences* terminal or sub-terminal racemes bearing 21–36 flowers, bracts ovate-cordate, 8–11 mm long, persistent, pedicels 9–14 mm long; bracteoles lanceolate, 1.1–2.0 mm long, glabrous, located at mid-pedicel. *Flowers* yellow, 15–25 mm long, the calyx 9–13 mm long, the tube truncate, the lobes 1.0–1.5 times as long as the tube, glabrous; corolla yellow, 15–23 mm long, the standard 12–16 mm long, 14–18 mm broad, retuse, the wings 9–12 mm long, the claws 2–4 mm long, broadly oblong, oblique, the keel 13–15 mm long, the twisted beak prolonged; stamens dimorphic, the long anthers 2.5–3.1 mm long, the short anthers 0.7–1.0 mm long; style with a pubescent stigma, geniculate, 8.0–11.0 mm long. *Legume* inflated, 3.2–4.0 cm long, glabrous, brown or dark brown at maturity; seeds ca. 22, dark brown, oblique cordiform, to 4.5 mm long.

Crotalaria spectabilis is native to India and has become naturalized in many tropical localities in the Old and New Worlds. In Panama this plant has escaped from cultivation and its distribution is sporadic. Of the native Panamanian species this plant most closely resembles *C. retusa*. The two species can readily be distinguished by bract characteristics and the glabrous calyces of *C. spectabilis*.

This species has been grown for its attractive flowers and as a green manure crop. One specimen (*Loftin*, SCZ) carries the common name "rattle box."

CANAL ZONE: slope of Ancón Hill, *Woodson et al. 1335* (G, MO, US). Curundú, *Dwyer 1766* (MO, SCZ); *Loftin* (SCZ). Hills on W side of canal near Pedro Miguel Locks, *Stimson 5220* (DUKE, SCZ). COCLÉ: 12 km NE of Río Hato along highway to Panama City, *Lasseigne 4288* (MO, NY). COLÓN: San Lorenzo, Fort Sherman, *Quistgard 20* (MO). DARIÉN: Upper Río Tuquesa, *Le Clezio 270* (MO). Yaviza along Río Chucunaque, cultivated, *Stern et al. 106* (GH, MO, US). PANAMA: Hospital del Seguro Social, Vía Bolivar, *Taylor 114* (F, MO). Villa Guadalupe, *De Hoyas 22* (MO).

11. **Crotalaria verrucosa** L., Sp. Pl. 715. 1753. TYPE: Lectotype, Ceylon, Herbarium Herman, folio 3:4 (BM).

C. angulosa Lam., Encyc. Méth. Bot. 2: 197. 1786. Superfluous when published, listed *C. verrucosa* as syn. TYPE: herb. Lamark (P-Lam).
C. caerulea Jacq., Ic. Pl. Rar. 1: 144. 1794. TYPE: not seen.
C. flexuosa Moench, Suppl. Meth. Pl. 55. 1802. Superfluous when published, listed *C. verrucosa* as syn.
C. hastata Steud., Nom. Bot. 231. 1821. Based on unnamed variety of *C. angulosa* Lam. LECTOTYPE: herb. Lamark (P).
Crotalaria verrucosa var. *acuminata* DC., Prodr. 2: 125. 1825. TYPE: herb. DC. (G-DC).
C. acuminata (DC.) G. Don, Gen. Syst. 2: 134. 1832. Based on *C. verrucosa* var. *acuminata* DC.
Anisanthera versicolor Raf., Fl. Tell. 2: 60. 1837. TYPE: unknown, usage *fide* Merrill, Index Raf. 1949.
A. hastata Raf., Fl. Tell. 2: 61. 1837. TYPE: unknown, usage *fide* Merrill, Index Raf. 1949.
Crotalaria paramariboensis Miq., Ann. Mag. Nat. Hist. 11: 14. 1843. TYPE. "prope Paramaribo in hortis" *Miquel* (U, not seen; photo BALT, MO).
Phaseolus bulai Blanco, Fl. Filip., ed. 2, 572. 1845. TYPE: not seen, usage *fide* Merrill, Sp. Blanco, 177. 1918.
Quirosa anceps Blanco, Fl. Filip., ed. 2, 398. 1845. TYPE: not seen, usage *fide* Merrill, Sp. Blanco, 177. 1918.
Crotalaria coerulea Bedd., Madras. J. Lit. Sci. 3: 178–179. 1858. TYPE: not seen. Orthographic version of *C. caerulea* of Jacq.

Herb or *suffrutescent* herb to 2 m tall, stems angled, strigulose. *Leaves* unifoliolate, broadly angular ovate or rhombic, the apex rounded, the base cuneate to attenuate, 3.4–4.5 cm long, 2.2–3.0 cm broad; entire, above glabrous to sparsely strigulose, beneath strigulose, the veins 4–6 on each side of the midvein; petiole 2–3 mm long; stipules crescent shaped, encircling the nodes, to 1.0 cm long. *Inflorescences* terminal or sub-terminal racemes bearing 8–13 flowers, the bracts narrowly triangular, 2.0–2.5 mm long, persistent, the pedicels 3–5 mm long; bracteoles narrowly triangular, to 1.1 mm long, strigulose, located at mid-pedicel. *Flowers* blue or white tinged with violet, 11–16 mm long; calyx 10–13 mm long, the tube campanulate, the lobes about twice as long as the tube, strigulose; corolla blue or white tinged with violet, 13–15 mm long, the standard 11–16 mm long, 12–17 mm broad, retuse, the wings 11–14 mm long, the claws 2–3 mm long, oblong lanceolate, oblique, the keel 13–16 mm long, the twisted beak prolonged; stamens dimorphic, the long anthers 2.8–3.2 mm long, the short anthers 0.6–1.0 mm long; style with a pubescent stigma, curved geniculate, 8.5–10.0 mm long. *Legume* inflated, 2.4–3.0 cm long, strigulose; seeds ca. 11, tan to brown, oblique cordiform, to 4.5 mm long.

Crotalaria verrucosa is widespread in the tropics and occurs in Central America, the West Indies and Florida as an introduced plant in disturbed ground at elevations up to 1,150 meters. This species is the only Panamanian species which has blue or purple tinged flowers. It may also be distinguished from other species by its unique crescent shaped stipules and its leaf shape. Although some authors recognize varieties based on leaf shape, no leaf variations are recognized in this treatment.

BOCAS DEL TORO: Bohio Soldado, *Cowell 232* (NY). Chiriquí Lagoon, *Wedel 1275* (GH, MO); *Wedel 2794* (GH); *Wedel 2809* (NY). Isla Colón, *Wedel 2794* (MO). Careening Cay, *Wedel 2809* (MO). CANAL ZONE: Ahorea Lagarto to Culebra, *Cowell 363* (NY).

16. CYMBOSEMA[33]

W. G. D'Arcy[34]

Cymbosema Benth., Bot. (Hooker) 2: 60. 1840. TYPE: *C. roseum* Benth.

High climbing *vines*. *Leaves* pinnate trifoliolate, leaflets elliptical, pubescent, pinnately veined; stipels and stipules present. *Inflorescence* an elongate raceme, the peduncle and rachis both elongate, the pedicels short, 2–6 at a node; bracts ovate, clasping the calyx. *Flowers* narrow, the calyx cupular, 4-toothed, the teeth deltoid acuminate, mostly slightly shorter than the tube; corolla red, rarely violet, the standard slightly longer than the wings and the keel, the wings narrowly spathulate, minutely auriculate; stamens 10, diadelphous, the vexillary stamen free, the others basally united, anthers all alike; ovary villous, the style and the stigma glabrous. *Legume* oblong, slightly falcate, compressed, prominently beaked by the downcurved persistent style, pubescent; seeds 4–6, subglobose, shiny, the hilum linear along one edge.

This genus is distinct in the Panamanian flora in its short, oblong pods with prominent beak and in its narrow red flowers. It is hardly distinct, however, from *Camptosema* Hook. & Arn. (1832) of ultra Andean South America. *Camptosema* differs principally in the minute hilum on the seeds and longer pod. This is the same kind and degree of difference which separates *Stizolobium* from *Mucuna*. *Cymbosema* is monotypic ranging from southern Mexico to Peru while *Camptosema* includes about 15 species mostly to the south of the range of *Cymbosema*.

Literature:

Maxwell, R. H. 1970. The genus *Cymbosema* (Leguminosae): notes and distribution. Ann. Missouri Bot. Gard. 57: 252–257.

1. **Cymbosema roseum** Benth., Bot. (Hooker) 2: 60. 1840. TYPE: Brazil, *Schomburgk 850* (K, not seen).—FIG. 17.

High climbing *vine*; stems drying angled, villous with appressed white hairs, tardily glabrescent. *Leaves* pinnate trifoliolate, the leaflets elliptical or ovate, mostly 5–11 cm long, 3–6 cm wide, apically obtuse, acute or acuminate but blunt tipped and mucronulate, basally obtuse, often ultimately rounded, the midvein elevated and prominent beneath, 4–5 main, arcuate veins on each side, drying discolorous, pubescent on both sides with ascending, subappressed white hairs, petiolules ca. 3 mm long, tomentose; petioles shorter than the terminal leaflet, fine puberulent; stipels ca. 1 mm long, appressed, sparingly pubescent; stipules deltoid acuminate, 1–3 mm long, pubescent. *Inflorescences* erect, the peduncle elongate, 7–20 cm long, terete, pubescent, the rachis somewhat narrower, to 15 cm long; pedicels at first aggregated at the tip, later more distant, 1–3 at a node, 2–4 mm long, often drying dark; bracteoles ca. 1.5 mm long, broadly ovate, cucullate, mucronulate, puberulent, clasping the calyx base. *Flowers* red or ?lav-

[33] This treatment is modified from a treatment of the genus prepared by Richard H. Maxwell in 1969.

[34] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

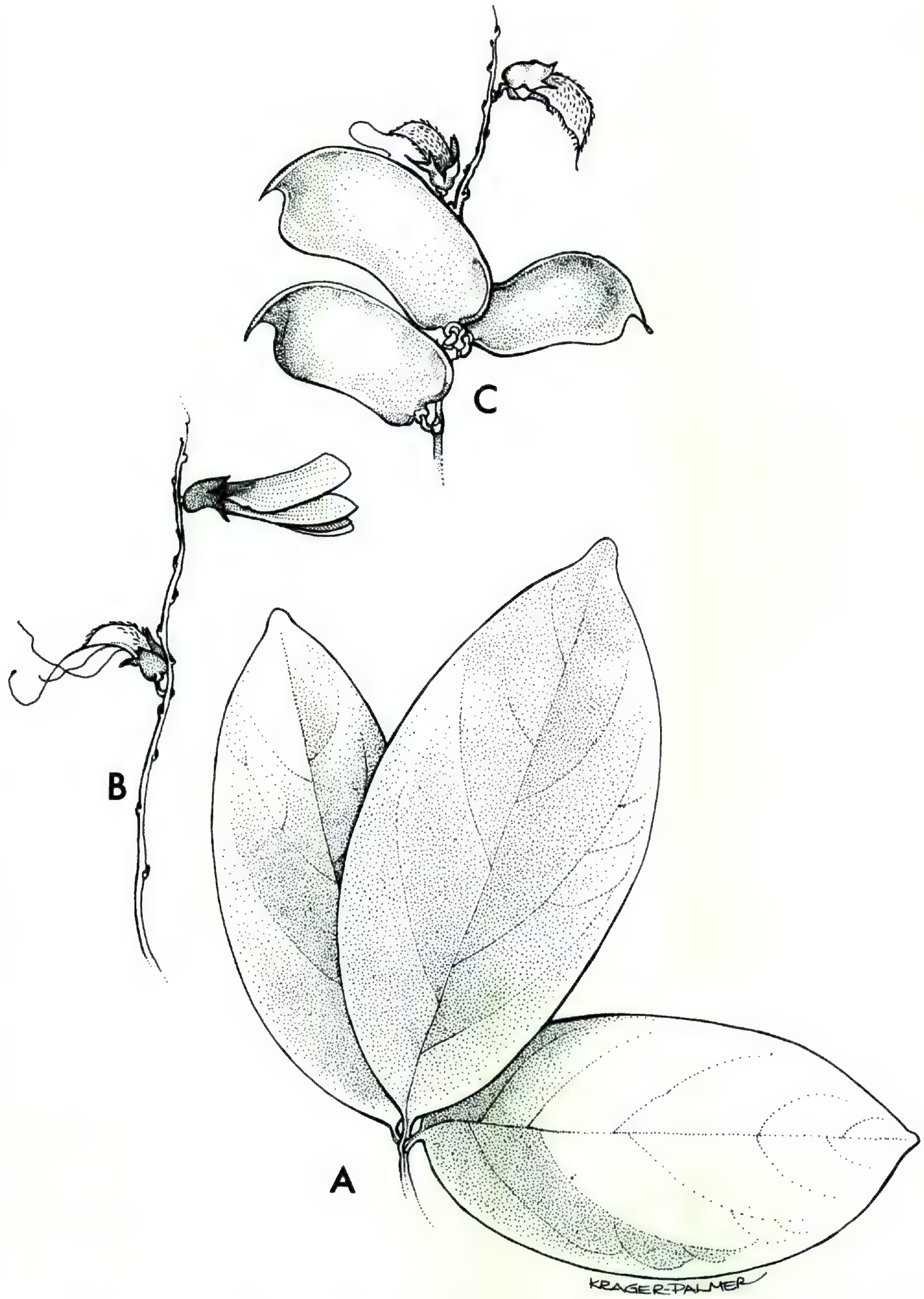

FIGURE 17. *Cymbosema roseum* Benth.—A. Leaf (×4/5).—B. Flower (×4/5). [After *Aviles 198*.]—C. Fruit (×4/5). [After *Shattuck 1094*.]

ender, 3–4 cm long, the standard slightly longer than the wings and keel, narrow, the wings and keel narrowly spatulate, minutely auricled; calyx tubular, the tube ca. 7 mm long, the 4 teeth deltoid, the upper lip longest, 4–5 mm long. The vexillary stamen free, the remainder fused basally, the anthers alike; ovary tomentose, the style and stigma glabrous. *Legume* oblong, compressed, prominently curved beaked, mostly 3.5–4 cm long, ca. 1.5 cm wide, drying slightly dark, the prominent curved beak 5–9 mm long, fine tomentose or velutinous, somewhat glabrescent; seeds 2–6, compressed globose, shiny, the hilum linear along the periphery of 1 side.

This species is rare in Panama occurring in tropical moist forests. It may be confused with *Dioclea guianensis* which has purple flowers, mostly less than 3 cm long, a fruit to 8 cm long with a short beak and the vexillary stamen is fused to the others. This species ranges from southern Mexico to Peru and Brazil. Most reports indicate that this species has red flowers; however, *Tyson & Clewell 5874* notes flowers lavender.

CANAL ZONE: Barro Colorado Island, *Aviles 19b* (MO); *Croat 8304* (MO, SCZ); *Shattuck 255* (F, MO), *1094* (F, MO); *Wilson 128* (F); *Woodworth & Vestal 687* (A, F, MO). PANAMÁ: Marsh area 2 mi S of Tocumen Airport, *Tyson & Clewell 5874* (FSU).

17. DALEA

Peter S. White[35]

Dalea [L.] Lucanus in L.,[36] Opera varia 244. 1758. nom. gen. conserv. Based on *Dalea* L. non *Dalea* Mill. 1754. (Solanaceae) nomen rejic. contra *Dalea* [L.] Lucanus, nec *Dalea* Browne, 1756. (inc. sed.), nec *Dalea* J. Gaertn., Fruct. 1: 235. 1788. (Verbenaceae).

[*Dalea* L., Hort. Cliff. 363, *tab. 22*. 1738. Based on a plant received from P. Miller = *Dalea cliffortiana* Willd.]

Parosela Cav., Descr. Pl. 185. 1802. TYPE: *Psoralea mutabilis* Cav. = *Dalea mutabilis* Willd. Non *Marina* Liebm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 103. 1853, emend. Barneby, Mem. New York Bot. Gard. 27: 55. 1977.

Thornbera Rydb., J. New York Bot. Gard. 20: 66. 1919. TYPE: *Thornbera albiflora* (Gray) Rydb. = *Dalea albiflora* Gray.

Perennial or annual *herbs* or *shrubs*; gland dotted and nearly always pubescent. *Leaves* alternate, imparipinnate, rarely paripinnate, trifoliate, or simple; leaflets relatively small, entire, conspicuously glandular dotted beneath, the rachis frequently margined or winged, glandular beneath; stipules herbaceous or gland-like; stipels usually represented by glands. *Inflorescence* of terminal or axillary spikes or racemes, often dense; bracts usually conspicuous, often glandular and pubescent. *Flowers* with the hypanthium campanulate or turbinate, 10-ribbed, often glandular, the glands and ribs sometimes obscured by pubescence; calyx teeth 5, more or less equal, as long as or longer than the cup; petals 5, white,

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[35] Uplands Field Lab., Great Smoky Mountains National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

[36] For a more complete generic synonymy see Barneby (1977) and Hutchinson (1967); for a full discussion of taxonomic concepts in *Dalea* and its relatives, see Barneby (1977).

blue, purple, less commonly yellow, inserted on the staminal sheath, the standard clawed, frequently inserted below the wing and the keel petals, the wing and the keel petals perched on and disjointing from the staminal sheath, the keel petals partially united or free; stamens 10, 9, sometimes 5, sometimes indefinitely 5–10, monadelphous, the sheath split to varying degrees, the anther connective often gland tipped; ovary 2-ovulate, only 1 ovule fertile, sessile or short stipitate, the style filiform, the stigma usually minute. *Fruit* a small, 1-seeded, obovoid legume, sometimes glandular, indehiscent, included within the persistent calyx; seed 1, subreniform, smooth.

Dalea is a genus of 150 or more species of gland-dotted shrubs and herbs with its highest diversity in relatively open vegetation on xeric sites in Mexico and the highlands of Peru. Only two species are known from Panama which, with adjacent countries, represents a gap in the genus' general diversity. *Dalea* can be recognized by the following combination of characters: glands present, petals adnate to the staminal tube, anther connective often glandular-appendaged, fruit 1-seeded and included in the persistent calyx.

The authorship of the conserved name *Dalea* is a matter of current debate (Barneby, 1965, 1977; Committee for Spermatophyta, 1968). Available for conservation were *Dalea* [L.] Lucanus (1758), (sometimes cited as *Dalea* L., see below), *Dalea* Juss. (1789), *Dalea* Vent. (1799), and *Dalea* L. C. Rich. (1803). Barneby's (1977) opinion has been followed here. *Dalea* [L.] Lucanus is the earliest of the names listed above and makes sense taxonomically (Barneby, 1977).

One difficulty with *Dalea* [L.] Lucanus is that *Opera varia*, the work in which the name appears (1758), is a reprint of three pre-1753 Linnaean works bound as a single volume. Linnaeus did not recognize *Dalea* as a genus in *Species Plantarum* (1753) nor thereafter. Rather he made it clear that *Dalea* should be regarded as a synonym of *Psoralea* L. Because Linnaeus did not intend *Dalea* L. as a generic concept except in pre-1753 works, Barneby (1977) has proposed "Lucanus" for authorship of the genus, which is the name Barneby gives the anonymous editor of *Opera varia* since the book was published in Lucca. This editor provided legitimate publication for the pre-1753 genus *Dalea*. While this is somewhat dissatisfying, it seems the best current solution. The interested reader is referred to the works cited above for further considerations in this dilemma.

Petalostemon Michx., nom. gen. conserv., and *Kuhnistera* Lam. are both regarded as synonyms of *Dalea* by Barneby (1977), an opinion also expressed by Shinners (1949) but disagreed with by Isley (1958). No species of these two genera are known from Panama.

Sixteen *Dalea* species were reported for Guatemala (Standley and Steyermark, 1946) and five species for Costa Rica (Standley, 1937), but not all are members of *Dalea* sensu Barneby. The two Panamanian species, *D. carthagenensis* (Jacq.) Macbr. and *D. cliffortiana* Willd., are the most widespread of the species in Central America. Among the plants occurring in Costa Rica and Guatemala, only one other is a strong possibility for Panama, *Marina scopa* Barneby (*Dalea nutans* sensu Standley and Steyermark (1946) = *Parosela nutans* sensu Standley (1937) = *Parosela nutans* sensu Rydb. (1920), non *Psoralea nutans*

Cav., non *Marina nutans* (Cav.) Barneby). This is a weedy species of xeric climates found from Mexico and Guatemala southward to Costa Rica, becoming rarer at the southern end of its range. It is sparingly adventive in Venezuela and Cuba. The following characters for the genus *Marina* are extracted from Barneby's key (1977): *Marina* has 1-ovulate ovaries; flowers always pedicellate; hairs of the calyx neither spirally twisted nor fulvescent in age; ribs of the calyx not anastomosing at the tip of each calyx tooth; leaflets marked on the upper surface with sinuous pallid lineoles ascending obliquely from the midrib. *Dalea* has 2-ovulate ovaries (only 1 matures); flowers often sessile, if pedicellate, the calyx pubescent with spiral, fulvescent hairs, or the calyx ribs anastomosing at the tip of each calyx tooth and excurrent as a mucro, or both; leaflets not lineolate.

Literature

Barneby, R. C. 1965. Conservation and typification of *Dalea*. Taxon 14: 160–164.

———. 1977. Daleae Imagines. Mem. New York Bot. Gard. 27. 891 pp.

Committee for Spermatophyta (R. McVaugh, secretary). 1968. Conservation of generic names, VIII. Taxon 17: 85–87.

Isley, D. 1958. Leguminosae: Psoraleae of the United States, a generic survey. Iowa State College, J. Sci. 33: 23–36.

Shinners, L. H. 1949. Transfer of Texas species of *Petalostemum* to *Dalea* (Leguminosae) and the genus *Dalea* (including *Petalostemum*) in north-central Texas. Field and Lab. 17: 81–89.

Standley, P. C. 1937. Flora of Costa Rica. Field Mus. Nat. Hist., Bot. Ser. 18: part 2.

a. Leaflets obovate or elliptic, ca. 2 times longer than broad ---------- 1. *D. carthagenensis*
aa. Leaflets narrowly oblong to linear, much more than 2 times longer than broad ---------- 2. *D. cliffortiana*

1a. **Dalea carthagenensis** (Jacq.) Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13: 375. 1943.—FIG. 18.

Psoralea carthagenensis Jacq., Enum. Pl. Carib. 27. 1760; Sel. Stirp. Amer. 206. 1763. TYPE: Cartagena (Colombia), (W, not seen; microfiche, MO).
P. enneaphylla L., Sp. Pl., (ed. 3) 1076. 1764. TYPE: "habitat in Indiis," not seen.
P. emphysodes Jacq., Coll. 4: 144. 1790. TYPE: Venezuela (W, not seen; microfiche, MO).
P. phymatodes Jacq., Icon. Pl. Rar. 3: 13. *pl. 563*. 1792. nom. illegit., a superfluous name based on *Psoralea emphysodes* Jacq.
Dalea enneaphylla (Jacq.) Willd., Sp. Pl. 3: 1338. 1802.
D. phymatodes (Jacq.) Willd., Sp. Pl. 3: 1338. 1802.
D. domingensis DC., Prodr. 2: 246. 1825. TYPE: "in Sancto Domingo," *Bertero* (holotype, G-DC, not seen; fide Barneby, 1977).
D. domingensis Spreng., Syst. Veg. 3: 327. 1826. TYPE: "Hispaniola," *Bertero*, not seen.
Parosela domingensis (DC.) Millsp., Publ. Field Columbian Mus. Bot. Ser. 1: 21. 1895.
P. domingensis (DC.) A. Heller, Cat. N. Am. Pl., (ed. 2) 6. 1900.
P. emphysodes (Jacq.) Rydb., No. Am. Fl. 24: 113. 1920.
Dalea carthagenensis subsp. *typica* R. T. Clausen, Bull. Torrey Bot. Club 73: 572. 1946.
D. carthagenensis subsp. *domingensis* (DC.) R. T. Clausen, Bull. Torrey Bot. Club 73: 572. 1946.
D. emphysodes (Jacq.) R. T. Clausen, Bull. Torrey Bot. Club 73: 85. 1946.
Dalea emphysodes subsp. *emphysodes* R. T. Clausen, Bull. Torrey Bot. Club 73: 85. 1946.

FIGURE 18. *Dalea carthaginensis* (Jacq.) Macbr.—A. Habit (×1).—B. Flower (×8).

1b. **Dalea carthagenensis** (Jacq.) Macbr. var. **barbata** (Oerst.) Barneby, Mem. New York Bot. Gard. 27: 517. 1977.

Dalea vulneraria γ barbata Oerst., Viddensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 4. 1854. TYPE: Mexico, *Oersted* (holotype, C, not seen).
Dalea vulneraria γ brevidens Oerst., Viddensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 4. 1854. TYPE: Mexico, *Oersted* (C, not seen).
Parosela barbata (Oerst.) Rydb., No. Am. Fl. 24: 116. 1920.

Shrubs or *subshrubs* to 2 m tall. *Leaves* alternate, imparipinnate, (2.5–)3–6(–7.5) cm long, apparently drought deciduous; leaflets (7–)9–13(–19), entire, glandular dotted and paler beneath, gray green (on drying?), elliptic, the base and the apex rounded, the apex occasionally retuse, or obovate with cuneate base, the size quite variable even on the same plant, (8–)12–17(–20) mm long, (4–6–8(–10) mm wide, becoming larger toward the tip of leaf; rachis narrowly winged; stipules narrowly triangular, the stipels apparently represented by glands. *Inflorescence* of terminal and axillary spikes, ca. 1.0–2.5 cm long; bracts ovate, to 5 mm long, gland dotted, pubescent, usually exceeding the hypanthium, apparently eventually deciduous. *Flowers* with the calyx 5–9 mm long, hairy, teeth 5, narrow triangular, equal; petals 5, white, apparently fading maroon, each petal with an apical gland, standard ca. 5 mm long, clawed, the wings ca. 5 mm long, clawed, keel petals ca. 6.5 mm long, clawed; stamens 10, the anther connective prominently gland tipped; ovary oblong, ca. 2 mm long, the style ca. 8 mm long, pubescent at base. *Fruit* an ovate, 1-seeded legume, 2.3–2.7 mm long, the valves densely gland dotted; seeds small, oblong.

Dalea carthagenensis is found from south Florida and Mexico southward through the West Indies and Central America to Peru and Venezuela. Barneby (1977) recognized 8 geographical races which he assigned to varietal rank. *Dalea carthagenensis* var. *barbata* is found from Mexico to Panama and is disjunct in Andean Colombia. In this variety, the intercostal calyx glands are small, pale, and usually masked by pubescence of the calyx. In *Dalea carthagenensis* var. *carthagenensis*, the intercostal glands are blisterlike and readily visible.

COCLÉ: Olá, 20–280 m, *Pittier 5100* (NY). HERRERA: Between El Potrero and Las Minas, *Croat 9654* (MO, NY). N of Las Minas, *Croat 9671* (MO). 10 mi S of Ocú, *Tyson et al. 3823* (MO). PANAMÁ: San Carlos, 0–10 m, *Allen 1139* (GH, MO, NY). Río Las Lajas, 20 m, *Allen 1601* (GH, MO, NY).

2. **Dalea cliffortiana** Willd., Sp. Pl. 3: 1336. 1802. Based on *Psoralea dalea* L.—FIG. 19.

Psoralea dalea L., Sp. Pl. 764. 1753. TYPE: Plate 22 in Linnaeus, Hortus Cliffortianus. 1738 (fide Barneby 1977).
P. annua Mill., Gard. Dict., ed. 8. 1768. Superfluous substitute for the cited *Psoralea dalea* L.
Dalea linnaei sensu auct., non Michx., Fl. Bor. Am. 2: 57. 1803.
D. acutifolia S. & M. ex DC., Prodr. 2: 245. 1825. TYPE: Mexico, Calques Dess., Fl. Mex., *pl. 228* (fide Barneby 1977).
D. angustifolia G. Don, Gen. Hist. Dichl. Pl. 2: 223. 1832. TYPE: Mexico, *Pavon* (OXF, not seen).
Amorpha glandulosa Blanco, Fl. Filip. 555. 1837. TYPE: Philippines, not seen. (Specimen of *Parosela glandulosa* (Blanco) Merrill labeled "neotype" at GH.)
Dalea nigra Mart. & Gal., Bull. Acad. Bruxelles 10: 43. 1843. TYPE: Mexico, *Galeotti 3263* (holotype, BR, not seen; isotypes, BR, P, W, not seen).
D. annua (P. Mill.) Kuntze, Rev. Gen. Pl. 1: 178. 1891.

FIGURE 19. *Dalea cliffortiana* Willd.—A. Habit (×1).—B. Flower (×8).

D. annua β willdenowii Kuntze, Rev. Gen. Pl. 1: 178. 1891. TYPE: unknown (fide Barneby (1977), this is based primarily on *Dalea cliffortiana* Willd.).
D. dalea (Lucanus) MacMil., Metasp. Minn. Vall. 330. 1892.
Parosela dalea (Lucanus) Britt., Mem. Torrey Bot. Club 5: 196. 1893.
Dalea virgata Micheli, Bull. Herb. Boissier 2: 442, *tab. 9*. 1894. SYNTYPES: Costa Rica, *Pittier 1462, 3828, 6504* (none seen). Non *Dalea virgata* Lag. (1816).
Parosela acutifolia (DC.) Rose, Bot. Gaz. 40: 144. 1905.
Dalea glandulosa (Blanco) Merrill, Philip. Gov. Bur. Lab. Bull. 27: 37. 1905.
Parosela cliffortiana (Willd.) Rose, Contr. U.S. Natl. Herb. 10: 105. 1906.
P. nigra (Mart. & Gal.) Rose, Contr. U.S. Natl. Herb. 10: 105. 1906.
Thornbera dalea (Lucanus) Rydb., N. Am. Fl. 24: 120. 1920.
T. robusta Rydb., N. Am. Fl. 24: 121. 1920. TYPE: Costa Rica, not seen.
T. pumila Rydb., N. Am. Fl. 24: 120. 1920. TYPE: Mexico, *Brandegee 1904* (US).
Parosela dalea var. *robusta* (Rydb.) Macbr., Contr. Gray Herb. 65: 22. 1922.
P. pumila (Rydb.) Macbr., Contr. Gray Herb. 65: 23. 1922.
Dalea pumila (Rydb.) Riley, Kew Bull. 1923: 337. 1923.
D. robusta (Rydb.) Cowan, Brittonia 8: 60. 1954.

Herb to 0.7 m tall, usually much branched above; stems terete or slightly ridged from nodes, glabrous, sometimes pubescent on upper parts of stem, glandular dotted but glands less dense, less regular than on leaves. *Leaves* alternate, imparipinnate, (1–)1.5–3.0(–5) cm long including the petiole and the terminal leaflet; leaflets (5–)11–15(–19), entire, gland dotted below, gray green (on drying?), linear to narrowly elliptic, (2–)4–8(–15) mm long, including petiolule, 1–2 mm wide, the leaflets becoming larger from the base to the tip of the leaf; rachis narrowly winged; stipules narrow, stipels represented by paired glands. *Inflorescence* narrow, compact spikes, terminal on the main and the lateral axes, becoming 0.8–3.5 cm long, 0.6–0.8 cm wide; bracts abruptly acuminate, pubescent at least on the margins, with long, soft hairs, gland dotted, green with light colored scarious margin. *Flowers* with the calyx 3–5 mm long, densely pilose, the teeth 5, triangular to acuminate, equal; petals 5, the standard white or rose tinged, 3–5 mm long, clawed, the wing and keel petals blue to pink, exceptionally white; wings 2.0–2.5 mm long, the keel petals 2.0–3.5 mm long; stamens 9–10, connective minutely gland tipped; pistil more or less pubescent. *Fruit* a 1-seeded, obovoid, dry legume, 2.0–2.5 mm long, the style base persistent; single seed oblong, ca. 1.5 mm long.

Dalea cliffortiana Willd. is found in dry fields, roadsides, and other disturbed sites, e.g., river and streamsides, from Mexico to Panama. It has become naturalized in Ecuador and Venezuela and also in the Philippines (Barneby, 1977).

COCLÉ: Olá, 100–350 m, *Pittier 5720* (US). HERRERA: La Avena to Pesé, 200 ft, *Burch et al. 1301* (DUKE, MO). 4 mi S of Los Pozos, *Tyson 2686* (FSU, MO). 2 mi W of Divisa, *Tyson 5154* (FSU). 10 mi S of Ocú, *Tyson et al. 2803* (MO). LOS SANTOS: La Honda, 0–5 m, *McDaniel 8060* (DUKE, FSU, MO). WITHOUT LOCALITY: *Burch et al. 1213* (MO).

18. DESMODIUM[37]

B. G. Schubert[38]

Desmodium Desv., Jour. Bot. sér. 2. 1: 122. Pl. V, *Fig. XV*. 1813, nom. cons.
TYPE: *D. scorpiurus* (Sw.) Desv. = *Hedysarum scorpiurus* Sw., typ. cons.

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[37] A list of generic synonyms is provided by Hutchinson, *Genera of Flowering Plants* 1: 481. 1964. *Meibomia* is the name used for the genus by Standley in his *Flora of the Panama Canal Zone*,

Meibomia Heister ex Fabr., Enum. 168. 1759. LECTOTYPE: *Hedysarum canadense* L.
Perrottetia DC., Ann. Sci. Nat. 4: 95. 1825, *non* H.B.K. Nov. Gen. Sp. Pl. 7: 57 (folio ed.); 7: 73 (quarto ed.). *t. 622.* 1824 [Celastraceae]. See DC. Mém. Légum. 312. 1826.

Herbs, subshrubs, or *shrubs,* prostrate or scrambling to erect. *Leaves* 1–3 (or rarely–5)-foliolate, petiolate, stipulate; leaflets petiolulate and stipellate. *Inflorescences* axillary or terminal, racemose or racemose paniculate, or extremely dense and capitate; primary bracts striate and ciliate, each subtending 1 (pedicellate) flower, or a fascicle of 2 to several flowers; secondary bracts often present, similar to the primary bracts or depauperate, each subtending a single flower; bracteoles rarely if ever present in American species. *Flowers* pedicellate, papilionaceous, calyx 2-lobed, the upper lobe almost entire to bifid, the lower 3-toothed with the central tooth longer than the laterals, or the calyx almost equally 5-lobed; corolla exceeding the calyx, the standard slightly clawed, wings somewhat so, wings often attached to keel petals by a small appendage, keel petals long clawed, partially fused above; vexillary stamen free or partially fused; anthers uniform; ovary sessile or stipitate, ovules 2–many, the style slender, the stigma terminal. *Fruit* lomentaceous, i.e., transversely septate and forming (1–)2–many articles, usually stipitate, indehiscent, or tardily dehiscent, or in 1 species in Panama the walls between the sutures falling away leaving the sutures as a frame; articles variously shaped from nearly linear to almost saccate or circular and notched at the apex, sometimes folded on each other in accordion fashion (at least when young), the surfaces glabrous to densely pubescent with straight tapering or hooked trichomes, or these only on sutures, the articles 1-seeded. *Seeds* oblong or subquadrate to reniform.

A genus of some 300 or more species of tropical and temperate areas of the world excepting New Zealand, Europe, and the United States west of the Rocky Mountains. Standley (1946) records one species in cultivation in southern California as an ornamental. The greatest center of diversity is in eastern Asia; centers of considerable magnitude occur also in Brazil and Mexico.

There is a large group of ruderal species, some of which have become pantropical weeds, and another group of species, growing only in woodlands and forests, which are less abundant and have more precise and restricted distribution. Representatives of both groups occur in the flora of Panama.

The fruits of many species are covered with hooked hairs which become attached to passing animals or to trouser legs very easily. This accounts for much

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Contr. U.S. Natl. Herb. 27: 210–212. 1928. Schindler maintains the genus *Nephromeria* to include several species occurring in Panama. These species will be recognized in the text by their synonymy.

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This treatment, commenced many years ago, has been accomplished with the aid of colleagues in many herbaria in this country and abroad, including A, B, BM, BR, C, CAS, DAO, DUKE, ENCB, F, FSU, G, GH, K, L, MEXU, MICH, MO, NY, OS, P, PMA, S, SCZ, U, UC, UPS, US, W. Their assistance in making available type specimens and/or photographs of them for study, as well as specimens from Panama and neighboring countries, some on long-term loan, is acknowledged with gratitude. Many type specimens were photographed while the author was a Fellow of the John Simon Guggenheim Memorial Foundation, and some field work was carried on when she was a Taxonomist with the New Crops Research Branch, A.R.S., U.S.D.A. Use of the original manuscripts, sketches, and fragments of specimens, of the late Dr. A. K. Schindler, purchased from him by the Arnold Arboretum of Harvard University, has also been of great help in understanding certain species.

of the distribution of weedier species. It is also the reason for the rather widespread common name "pega pega" applied to many species. The reason for Hutchinson's placement of the genus *Desmodium* under that branch of his key having "Fruits without hooked hairs" is puzzling.

The genus *Desmodium* is the largest member of the tribe Desmodieae, even if considered in the narrowest sense and with many subgeneric taxa raised to generic status. It is treated broadly here with the "satellite" genera maintained in infrageneric categories.

Specimens of one collection, *Tyson 6339* from Chiriquí Province, have come to me from MO and FSU. The Missouri sheet was annotated as *Desmodium caripense* "vel sp. aff." The Tyson material differs from *D. caripense*, however, in shape and pubescence of the leaflets, those of *D. caripense* being ovate attenuate in outline, and glabrous or glabrescent on the abaxial surface; in having longer, persistent, more obviously clasping stipules; and in number of articles per loment. It is similar to *D. venustum* Steudel of Mexico which, however, has long bracts (0.9–1.5 cm) that are gradually acuminate; it seems also to bear some relationship to *D. alamanii* DC. which differs in its densely pyramidal, much shorter inflorescences, slenderer primary bracts, shorter pedicels, and smaller glabrescent articles of the loment. From *D. ghiesbreghtii* Hemsley the Tyson material differs in its much longer persistent stipules, longer pedicels (14 mm vs. 4 mm, in fruit in *D. ghiesbreghtii*), and longer and broader loment articles. Additional material, especially in flower, will help to determine whether *Tyson 6339* is an undescribed species and if its relationship is with those species noted here as well as with *D. maxonii* and its other relatives treated in an earlier paper (Schubert, 1941). The label on the Tyson collection reads: Chiriquí, canyon of waterfall 5 mi NE of El Volcán, 6500 ft.

Literature:

Blake, S. F. 1924. New American meibomias. Bot. Gaz. 78: 271–288.

Ohashi, H. 1973. The Asiatic species of *Desmodium* and its allied genera (Leguminosae). Ginkgoana 1: 1–318; pls. 1–76.

Schindler, A. K. 1928. Die Desmodiinen in der botanischen Literatur nach Linné. Repert. Spec. Nov. Regni Veg. Beih. 49: 1–371.

Schubert, B. G. 1940. *Desmodium*: preliminary studies I. Contr. Gray Herb. 129: 3–31.

———. 1941. *Desmodium*: preliminary studies II. Contr. Gray Herb. 135: 78–115; pls. 1–3.

———. 1963. *Desmodium*: preliminary studies IV. J. Arnold Arbor. 44: 284–297.

a. Leaves regularly unifoliolate, leaflets linear lanceolate; sutures of the whole loment remaining more or less intact after the walls of the articles fall away ---------- 3. *D. angustifolium*

aa. Leaves regularly trifoliolate, leaflets not linear lanceolate; each article of the loment detaching with its sutures intact or the upper suture alone pulling away (starting at the proximal end of the loment), or rarely the articles partially separating, then dehiscing along the lower suture.

b. Articles of loment with dorsal (upper) suture straight to deeply concave, i.e., narrowly or broadly notched or indented.

c. Articles of the loment almost orbicular or saccate in outline, essentially flat, notched on the dorsal suture, not filled by the seed.

d. Articles small, almost as broad (high) as long,[39] 10–12 mm broad (including notch), 12–14 mm long, notch on dorsal suture narrowly V-shaped, article ± beaked at the termini of the dorsal suture; stipe ± equal to pedicel in length, essentially glabrous ---------- 11. *D infractum*

dd. Articles of the loment much larger, usually 2 cm or more long and high; notch on dorsal suture narrow to broad; articles beaked or not; stipe equal to or exceeded by the pedicel, puberulent to pubescent or glabrate.

e. Articles with flattened shoulders or else beaked when fully mature; leaflets ± tomentose on abaxial surface; stipe of loment pubescent.

f. Articles with flattened shoulders when mature; pedicel about equal to the stipe in length ---------- 13. *D. macrodesmum*

ff. Articles with shoulders only partially, if at all, flattened, becoming beaked when fully mature; pedicel usually exceeding stipe ---------- 18. *D. rhynchodesmum*

ee. Articles without flattened shoulders and not becoming beaked at maturity, the notch forming a sharply acute or obtuse angle; leaflets not tomentose on abaxial surface; pedicel exceeding the glabrate stipe in length ---------- 19. *D. saccatum*

cc. Articles of the loment smaller and not saccate or orbicular in outline, essentially filled by the seed when mature; the dorsal suture straight or only slightly concave or invaginated at the center.

g. Flowers borne in pairs; each pair subtended by 1 large primary bract; each pedicel usually subtended by a smaller secondary bract, or secondary bract lacking.

h. Each pair of pedicels subtended by a primary bract; each pedicel usually subtended by a smaller secondary bract.

i. Stems with inconspicuous pubescence of short hooked trichomes; leaflets short pilose on abaxial surface.

j. Leaflets rhombic, rhombic ovate, or rhombic orbicular, obtuse or rounded at apex; stipe of loment 3–4.6 mm long ---------- 4b. *D. axillare* var. *axillare*

jj. Leaflets ovate, rather abruptly short acuminate; stipe of loment 4.6–8 mm long ---------- 4c. *D. axillare* var. *stoloniferum*

ii. Stems with long dense pubescence of straight trichomes; leaflets ovate or elliptic ovate, long pilose abaxially, acute to gradually (usually long-) acuminate ---------- 4a. *D. axillare* var. *acutifolium*

hh. Each pair of pedicels subtended by a primary bract only; secondary bracts lacking.

k. Primary bracts early deciduous, inflorescence lax; calyx puberulent and slightly short pilose along central tooth of lower lobe.

l. Leaflets (terminal) to 2.3 cm long and 1.5 cm wide; articles of the loment to 5.5 mm long ---- 1. *D. adscendens*

ll. Leaflets (terminal) to 0.6 cm long and 0.7 cm wide; articles of the loment to 4.5 mm long ------- 23. *D. triflorum*

kk. Primary bracts persistent, inflorescence dense; calyx long silky pilose and ciliate ---------- 5. *D. barbatum*

gg. Flowers borne singly (rarely in *D. incanum* more than one in a fascicle), each pedicel subtended by 1 large primary and 2 smaller secondary bracts.

m. Loments multiarticulate, dorsal suture straight; isthmi broad or narrow; margins of leaflets not undulate.

n. Isthmi (area between the articles) nearly equaling length of article, loments to 7-articulate; leaflets thick, veins prominent ---------- 10. *D. incanum*

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[39] The length of the article in species of *Desmodium* sect. *Nephromeria* is measured as are those in other sections of the genus, along the long axis of the loment, assuming that more than one article may always occur. This conforms also to the long axis of the seed. The height of the article is, therefore, the width in this sense.

nn. Isthmi (area between the articles) narrow, loments to 4-articulate; leaflets thin, veins not prominent ---------- 2. *D. affine*

mm. Loments 2–3-articulate, dorsal suture curved or invaginated; isthmi very narrow; margins of leaflets undulate ---- 24. *D. wydlerianum*

bb. Articles with dorsal suture straight to curved, or obtusely to acutely angulate.

o. Pedicels borne in fascicles of 2–several, each fascicle subtended by a narrowly ovate, greenish to stramineous primary bract; each pedicel further subtended by a similar slenderer secondary bract; young inflorescences with fascicles early distinct.

p. Isthmi between articles central.

q. Plants prostrate; articles slenderly elliptic, sutures scarcely constricted at isthmi ---------- 20. *D. scorpiurus*

qq. Plants erect, mostly tall and usually becoming shrubby; articles chiefly rhombic in outline (excepting occasionally the terminal), sutures markedly constricted.

r. Terminal article of each loment regularly much dilated, reniform to elliptic ---------- 9. *D. glabrum*

rr. Terminal article of each loment equaling the others in size and shape.

s. Leaflets thick and with prominent reticulate venation.

t. Pedicels stiff, ascending to spreading at maturity, borne in pairs ca. 1 cm apart, 1–1.6 cm long; articles of the loment 3–3.5 mm long, 2.6–3.5 mm wide ---------- 22. *D. tortuosum*

tt. Pedicels more slender, ascending, borne in pairs less than 1 cm apart, 1 cm (or less) long; articles of the loment smaller, 1.5–2.5 mm long, 1.5–2 mm wide.

u. Leaves regularly trifoliolate, abaxial surface rough; pedicels 6–10 mm long; at least the terminal (sometimes 3) article glabrous ---- 8. *D. distortum*

uu. Leaves regularly unifoliolate, abaxial surface velvety tomentose; pedicels 2.5–3 mm long; all articles of the loment with some straight pubescence ---------- 16. *D. perrottetii*

ss. Leaflets thinner, not prominently reticulate.

v. Pedicels to about 1.2 cm long, straight, stout; bracts deciduous; articles appearing twisted but not coiled ---- 17b. *D. procumbens* var. *procumbens*

vv. Pedicels longer, usually 1.2–2 cm long, flexuous, filiform; bracts persistent; articles appearing to be tightly coiled ------ 17a. *D. procumbens* var. *longipes*

pp. Isthmi between articles eccentric ---------- 7. *D. campyloclados*

oo. Pedicels borne in pairs, each pair subtended by a broadly ovate, stramineous to olivaceous primary bract; each pedicel usually further subtended by a smaller, sometimes differently shaped and much thinner and paler, i.e., depauperate, secondary bract; young inflorescences with bracts densely imbricate.

w. Isthmi between articles central ---------- 14. *D. maxonii*

ww. Isthmi between articles eccentric.

x. Pedicels short (2.5–6 mm long), reflexed or erect at maturity, leaflets sometimes lustrous above.

y. Stems and leaflets sericeous tomentose; pedicels strongly reflexed in fruit ---------- 21. *D. sericophyllum*

yy. Stems pilose, leaflets lustrous above; pedicels erect at maturity ---------- 6. *D. cajanifolium*

xx. Pedicels longer (mostly 1–2 cm long) or, if not longer, then pedicels not sharply reflexed in fruit and leaflets not lustrous above.

z. Scandent to erect plants with stout trisulcate stems ---------- 12. *D. intortum*

zz. Prostrate or decumbent plants with slender terete stems ---- 15. *D. molliculum*

1. **Desmodium adscendens** (Swartz) DC., Prodr. 2: 332. 1825.

Hedysarum adscendens Swartz, Prodr. 106. 1788; Fl. Ind. Occ. 3: 1263. 1806. TYPE: Ind. Occ. *Swartz* (S, holotype; GH, photo).
Hedysarum adscendens var. *β caeruleum* Lindl. Bot. Reg. *tab. 815*. 1824. LECTOTYPE: Bot. Reg. *tab. 815*.
Desmodium adscendens var. *β ?coeruleum* (Lindl.) DC., Prodr. 2: 332. 1825.
Meibomia adscendens (Swartz) Kuntze, Rev. Gen. Pl. 1: 195. 1891, *pro parte*.

Herbs, 6–24 inches tall, repent or forming tussocks, the stem terete, striate with stiff, upwardly appressed to spreading pilosity. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate lanceolate with long attenuate apex and slightly auriculate base, 0.5–1 cm long, 1.5–3 mm wide, striate, ciliate, the abaxial surface glabrescent, persistent; petioles sulcate adaxially, pilose, 1–1.8 cm long; leaf rachis similar to the petiole, 0.3–0.8 cm long; stipels linear attenuate, ciliate, 1–2 mm long; petiolules stouter than leaf rachis and with stiffer pilosity, 1–3 mm long; leaflets elliptic obovate, acute to obtuse and emarginate at the apex, cuneate to rounded at the base, densely pilose on both surfaces, the terminal leaflet 1.7–4 cm long, 0.75–2 cm wide, lateral leaflets 1.3–3 cm long, 0.7–2 cm wide. *Inflorescence* of terminal and axillary racemes, rachis striate to grooved, sparsely to abundantly stiff pilose and finely puberulent with multicellular and uncinulate trichomes; primary bracts ovate acuminate with long attenuate apex, striate, ciliate, pilose and puberulent on abaxial surface, early deciduous, 3.5–5 mm long, 1.5–2 mm wide, each subtending 2 pedicels, secondary bracts absent or, if (rarely) present, depauperate; pedicels with pubescence similar to that of rachis, 0.5–1 cm long. *Flowers* with the calyx distinctly bilabiate, the tube minutely puberulent throughout, teeth of both lobes pilose along each midrib and at the apex, teeth of lower lobe 2–3 mm long, upper bifid lobe 2–3 mm long; corolla usually pink, standard obovate, short unguiculate, 4–5 mm long, 2.5–3.5 mm wide, wings oblong, broader above, short unguiculate, slightly auriculate, 3–3.5 mm long, 1–2 mm wide, keel petals triangular, truncate at the apex, gradually narrowed to a long claw, 3.5–4 mm long, 1 mm wide. *Loment* stipitate, stipe 0.5–2 mm long, 1–5-articulate, articles oblong, straight on the upper suture, curved below, constricted about ½ their width at the isthmi, uncinulate pubescent and puberulent throughout, 3.5–5.5 mm long, 2.5–3 mm wide; *seed* transversely elliptic, 2.5 mm long, 1.5 mm wide.

Desmodium adscendens is widespread in tropical areas of Asia, Melanesia (see Ohashi, 1973), Africa and America. With *Desmodium incanum* and *D. scorpiurus*, it is one of the most common species.

There is a much larger synonymy for *Desmodium adscendens* than here indicated. It has not, however, entered the literature of Panama.

BOCAS DEL TORO: Ojo del Agua ca. 7 km W of Almirante, 190–220 m, *Croat 38133* (MO). Changuinola Valley, *Dunlap 214* (US). Río Teribe, mostly 2nd growth near Quebrada Lukulon, 90 m, *Kirkbride & Duke 522* (SCZ). Zigla Road at junction of Changuinola and Teribe Rivers, *Lazor et al. 2488* (FSU, MO, SCZ). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 5904, 5951, 5989* (all MO), *6796* (A, MO), *8509* (MO), *10763* (MO, SCZ), *11060, 11165* (both MO), *11727* (MO, SCZ), *16569, 17035* (both MO); *Dodge 3479* (G, GH); *Ebinger 21* (GH, MO); *Luteyn 1348* (DUKE); *Netting 33* (MO); *Robyns 65-22* (MO); *Shattuck 142* (MO). Summit Gardens, *Bottimer 1508* (DAO). Frijoles, *Bottimer 1496* (DAO). Chagres, *Fendler 77* (K). 5 mi E of Ferry Thatcher bridge near mangrove swamp, *Lazor 3311* (FSU, SCZ). Pipeline road, 16.8 km from beginning of road; 0–100 m, *Mori &*

Kallunki 1765 (MO). Trail between Gamboa and Cruces, 50–80 m, *Pittier 3769* (G, GH, US). Frijoles, *Pittier 6835* (G, GH, US). Old Fort San Lorenzo, *Tyson 1559* (SCZ). Pipeline road, *Witherspoon & Witherspoon 8287* (MO). CHIRIQUÍ: Roadside above Princess Janca finca, Boquete, *D'Arcy & D'Arcy 6334* (MO). Volcán/Cuesta de Piedras, site 84, 1000–1200 m, *Burt & Koster 159* (MO). Boquete Dist., 3800 ft, *Davidson 711* (GH, MO, US). Just W of the Fortuna camp, 1400–1600 m, *Folsom et al. 5373* (MO). Between Concepción and Hato de Volcán, 1080 m, *Koster 159* (A). Nueva California, 4000 ft, *Tyson 5707* (DUKE, FSU, MO, SCZ). Boquete, 1200–1500 m, *Woodson & Schery 719* (G, GH, MO, US). Finca Lérida to Boquete, 1300–1700 m, *Woodson et al. 1166* (G, GH, MO, US). COCLÉ: Road past Furlong's Finca, N of Cerro Pilón, 880 m, *Croat 37512* (MO). Road to El Valle de Antón, *D'Arcy & D'Arcy 6717A, 6721, 6742* (all MO). Top of El Petroso, N of El Copé, 800 m, *D'Arcy 11336* (MO). Slopes of Cerro Pilón near El Valle, 700–900 m, *Duke 12189* (MO, OS). Foothills of Cerro Pilon near El Valle, 900 m, *Duke & Correa 14701* (NY). Summit of Cerro Pilón above El Valle de Antón, 2700 ft, *Dwyer et al. 4496* (MO). Boca del Toabré at confluence of Rió Toabré and Río Coclé del Norte, *Lewis et al. 5514* (MO, SCZ). El Valle, *Ebinger 951* (MO), *1121* (GH, MO). Summit at Alto Calvario, 900 m, *Folsom & Robinson 2394* (MO). El Valle de Antón, 1000–2000 ft, *Lewis et al. 2610* (MO); 3100 ft, *Luteyn 4054* (DUKE); 2000 ft, *Porter et al. 4592* (MO); *Wilbur & Luteyn 11755* (DUKE). Bismark above Penonomé, *Williams 139* (US). COLÓN: Miguel de la Borda, *Croat 10044, 10054* (both MO). Gatún Lake, Goodyear Allweather Estate, *Seibert 1525* (MO, US). 5 mi NE of Sabanita towards Portobelo, *Wilbur & Luteyn 11618* (DUKE). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11178* (DUKE). DARIÉN: Río Pirre near crossing of trail from El Real to Tucutí, 20 mi W of El Real, *Duke 5200* (MO). Village of Manené, *Kirkbride, Jr. & Bristan 1614* (MO). Río Tuquesa at lower Tuquesa Mining Company camp called Charco Chiva (=Quebrada Venado on Darien radar map), 100 m, *Mori 6979* (MO). Río Paya, trail between Paya and Payita, *Stern et al. 356* (GH, MO, US). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11880* (MO). From 1 mi S to 10 mi N of Tonosi, *Duke 12480* (NY, OS). PANAMÁ: Cerro Campana, 2400–2700 ft, *Duke 8694* (MO). Between Cañasas and Sabalo, ca. 100 m, *Duke 14477* (MO, NY, OS). Chimán, *Lewis et al. 3300* (GH, MO). Cerro Azul, *Tyson 2175* (FSU, SCZ). SAN BLAS: Hills SE of Puerto Obaldía, *Croat 16723* (A), *16741* (MO). Puerto Obaldía, Croat *16867* (MO), *16875, 17009* (both A). Trail E of Cangandí-Mandinga airport road, 2–5 mi S of Mandinga airport, *Duke 14809* (NY). Puerto Obaldía, 0 to 50 m, *Pittier 4368* (US). Molia, *Stier 47* (MO). VERAGUAS: Río Primero Braso, 2.5 km beyond Agriculture School Alto Piedra near Santa Fe, 700–750 m, *Croat 25473* (MO). 0.6 mi beyond Escuela Agricola Alto Piedra, 730 m, *Croat & Folsom 34001* (MO). Mouth of Río Concepción, *Lewis et al. 2825* (GH, MO, UC). Base of Cerro Tute, 6.5 km outside of Santa Fé, *Folsom 3008* (MO).

2. **Desmodium affine** Schlecht., Linnaea 12: 312. 1838. TYPE: Mexico, Veracruz, Prope Jalapam et Hacienda de la Laguna, *Schiede*. Not seen.

Desmodium albiflorum Salzm. ex Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 17. 1854, nomen nudum; Benth. in Mart. Fl. Bras. 15(1): 99. 1859. TYPE: Brazil, Bahia, *Salzmann* (K, not seen; photo A).
Meibomia affinis (Schlecht.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. albiflora (Benth.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

Procumbent woody *herb* with erect peduncles; stem uncinulate puberulent and moderately long spreading pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate acuminate, striate, puberulent on abaxial surface, ciliate, persistent, 4–6.5 mm long, 2–2.5 mm wide; petioles sulcate on adaxial surface; pubescence similar to that of stem, 2.6–3.2 cm long; the leaf rachis similar, ¼ or less the length of petiole; stipels lance attenuate, striate, puberulent and ciliate, persistent, 2.5–4 mm long; petiolules stouter than the leaf rachis, densely spreading pilose, 1–2.5 mm long; leaflets thin, uncinulate puberulent and sparsely scattered pilose on adaxial surface, paler and with veins more prominent on the sparsely uncinulate puberulent and pilose abaxial surface, the margins ciliate at least near base, the terminal leaflet ovate, acute to obtuse, the base rounded to deltoid, 3.6–4.8 cm long, 2.3–3.2 cm wide, lateral leaflets obliquely oval, acute, 2.9–4 cm long, 1.7–2.5 cm wide. *Inflorescences* axillary and terminal; the rachis angulate, uncinulate puberulent, remotely if at all pilose; primary bracts ovate

acuminate, striate, puberulent and ciliate, not long persistent, 1.5–3 mm long, 1 mm wide; secondary bracts similar, 1–1.5 mm long, 0.5 mm wide; pedicels borne singly, each subtended by 1 primary bract and 2 secondary bracts (borne laterally), densely uncinulate puberulent, 8–11 mm long. *Flowers* with the calyx bilabiate, uncinulate puberulent, pilose on the teeth of both lobes, the teeth of lower lobe acuminate, almost equal, 3.5–4 mm long, the upper bifid lobe 3.5–4 mm long; corolla somewhat longer than the calyx, standard obovate, narrowly cuneate at base, 5.5 mm long, 4 mm wide, wings oblong, unguiculate, 6 mm long, 1.5 mm wide, keel petals oblong to remotely scythe shaped, long unguiculate, 5.5–6 mm long, 1.5–2 mm wide. *Loments* short stipitate, the stipe 1.5–2 mm long, to 5-articulate, articles oblong, the upper suture straight, the lower curved, constricted at the isthmi, articles densely uncinulate puberulent, 5.5–6 mm long, 2.5–3 mm wide; seed transversely elliptical, 3 mm long, 1.5 mm wide, the funicle short.

This species occurs in southern Mexico, Central America, the West Indies, and the northern half of South America.

The above noted seed measurements were taken from *Standley 28941* (GH), Honduras.

CANAL ZONE: Balboa, *Standley 25417* (US), *26076* (MO, US), *29262* (US).

3. **Desmodium angustifolium** (H.B.K.) DC., Prodr. 2: 328. 1825.—FIG. 20G.

Hedysarum angustifolium H.B.K., Nov. Gen. Sp. Pl. 6: 404 (folio ed.); 6: 517, 518 (quarto ed.). 1824.
TYPE: Mexico (P; photo GH).
Desmodium linearifolium DC., Prodr. 2: 327. 1825; Mém. Légum. 325. 1826, non G. Don, Gen. Syst. 2: 294. 1832. TYPE: "ex itin. Nee in hb. Thib."
Meibomia angustifolia (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 197. 1891, non *M. angustifolia* (T. & G.) Kearney, Bull. Torr. Bot. Club 20: 481. 1893.
M. linearifolia (DC.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Desmodium angustifolium var. *typicum* Schubert, Contr. Gray Herb. 129: 27. 1940.

Tall, erect, somewhat woody *herbs* to almost 3 m high; stem angulate, glabrescent to densely uncinulate puberulent. *Leaves* unifoliolate, stipulate, petiolate; stipules early deciduous, ovate attenuate (the slender tip almost ½ the total length), striate, puberulent, stiffly ciliate, 3–9 mm long, 0.7–2 mm wide; petioles striate, minutely puberulent, 0.15–1 cm long, stipels lance attenuate, persistent, 1–3.3 mm long, petiolules puberulent and stiffly pilose, 0.5–1.7 mm long; leaflets sparsely to densely uncinulate puberulent on both the surfaces and sparsely strigose chiefly on the midrib and the veins of abaxial surface, linear lanceolate, acute and mucronate at the apex, acute at the base, (3–)8–16 cm long, 0.2–0.6 cm wide. *Inflorescence* racemose paniculate, rachis uncinulate-puberulent and somewhat stiffly pilose; primary bracts each subtending a fascicle of 2–several pedicels, ovate acuminate, striate, puberulent on the abaxial surface, stiffly ciliate, 1.7–3.5 mm long, 0.5–1 mm wide, each pedicel further subtended by a similar smaller lance acuminate secondary bract 0.8–2 mm long and 0.4–0.5 mm wide; pedicels pubescent as on the rachis, 4–7 mm long. *Flowers* with the calyx puberulent and stiffly pilose, the margins of the teeth of both lobes stiffly ciliate, the upper bifid lobe 2–2.4 mm long, lateral teeth of lower lobe 2–2.3 mm long,

FIGURE 20. *Desmodium*.—A–F. *Desmodium axillare* (Sw.) DC. var. *acutifolium* (Kuntze) Urb.—A. Habit (×½).—B. Flower (×6).—C. Corolla.—C^1. Standard (×4).—C^2. Wing petal (×4).—C^3. Keel petal (×4).—D. Stamens.—E. Pistil.—F. Fruit (×2). [After *Erlanson 296.*]—G. *Desmodium angustifolium* (H.B.K.) DC. Fruit. Note dehiscence with the rim separating. [After *Allen 1269.*]

the central tooth 2–2.5 mm long; corolla with the standard flabellate and short unguiculate, 3–4.7 mm long, the wings oblong, slightly auriculate and short unguiculate, equaling or slightly exceeding the standard in length, the keel petals less markedly auriculate, longer unguiculate than the wings, 3.4–5 mm long and 1–2 mm wide. *Loment* short stipitate, 3–8-articulate, the stipe 0.5–2 mm long, the articles essentially orbicular, uncinulate puberulent on the surfaces and stiffly

pilose on surfaces and suture, 3–4 mm long, 2–2.5 mm wide, the walls of the articles often dehiscing from the suture which remains essentially intact; *seed* transversely oblong, 1.8 mm long, 1 mm wide.

This species ranges from Mexico and Central America to northern South America.

The characteristic falling away of the walls of the articles of the loment, often leaving the suture of the whole loment intact, distinguishes *Desmodium angustifolium*. This character occurs frequently in species of *Mimosa* but has been observed in only one other American species of *Desmodium*.

Desmodium gramineum Gray, which was treated by me (1940) as a variety of *D. angustifolium* is not related to this species, and my early treatment of *D. gramineum* in this way should not be followed.

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5181* (US). Sosa Hill, Balboa, *Standley 25274* (MO, US), and *26441* (US). CHIRIQUÍ: from Boquete to 3 mi N, 3300–4300 ft, *Lewis et al. 649* (MO). Sabana de la Tortuga between Boquete and Caldera, 300–700 m, *Pittier 5733* (US). HERRERA: 10 mi S. Ocú, *Tyson et al. 2877* (MO, SCZ). PANAMÁ: San José Island, *Johnston 370* (GH, US), *1269* (BM). El Valle, 580 m, *Rattray 29* (A); *Seemann 204* (K), *Seemann* (BM). Las Sabanas, *Standley 25898* (MO, US). Between Las Sabanas and Matías Hernández, *Standley 31869* (US). VERAGUAS: Above Río Santa María along road to Santiago, 5 km S of Santa Fé, 250–300 m, *Nee 8112* (MO). PROVINCE UNKNOWN: *Duchassaing* (P).

4. **Desmodium axillare** (Swartz) DC., Prodr. 2: 333. 1825.

Herbs, the stem repent and rooting at the nodes, the internodes 1.3–11 cm long. *Leaves* trifoliolate, stipulate, the stipules connate up to ½ their length, early deciduous; petioles to 10 times the length of the leaf rachises, leaf rachis to 12 mm long or occasionally lacking; petiolules of the lateral leaflets usually somewhat longer than those of the terminal leaflet. *Inflorescence* racemose, the racemes arising from the leaf axils; bracts early deciduous; calyx uncinulate puberulent over the whole surface with stout straight trichomes along the teeth of both lobes. *Flowers* with the corolla always exceeding the calyx; standard obovate or more rarely ovate, broadly acute below or narrowing slightly to an obtuse or truncate base, rounded at apex, retuse, the wings obliquely obovate, truncate or obtuse at apex, auriculate at base, short clawed, the keel petals fused, more or less falcate, obtuse at the apex, broadly clawed. *Loment* 1–3-, mostly 2-articulate, stipitate, the upper suture continuous, essentially straight.

This species is composed of three well defined, easily distinguishable varieties all of which occur in Panama.

4a. **Desmodium axillare** var. **acutifolium** (Kuntze) Urb., Symb. Ant. 4: 292. 1905.—FIG. 20A–F.

Meibomia axillaris (Swartz) Kuntze var. *β. acutifolia* Kuntze, Rev. Gen. Pl. 1: 195. 1891.
Nephromeria axillaris (Swartz) *β. acutifolia* ["acutifoliola"] (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1925.
Desmodium axillare var. *β. angustatum* Urb., Symb. Ant. 2: 303. 1900.
D. axillare var. *β. angustatum* fo. *robustius* Urb., Symb. Ant. 2: 303. 1900.
D. axillare var. *β. acutifolium* fo. *robustius* (Urb.) Urb., Symb. Ant. 4: 292. 1905. Based on *D. axillare* var. *β. angustatum* fo. *robustius*.
Nephromeria axillaris var. *β. acutifolia* (Urb.) Schindl. fo. *robustior* (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1925.

Hedysarum oblongifolium Bertero ex DC., Prodr. 2: 332. 1825, *pro syn.*
Desmodium oblongifolium Bertero ex DC., Prodr. 2: 332. 1825.
Meibomia umbrosa Britt., Bull. Torrey Bot. Club 37: 353. 1910.
M. prorepens Blake, Contr. U.S. Natl. Herb. 24: 6. 1922.

The variety *acutifolium* is characterized by the long dense pubescence of its stems in contrast to the short uncinulate pubescence on the stems of the other 2 varieties, and the ovate to elliptic ovate, usually long acuminate leaflets densely long pilose on the abaxial surface. It is found more or less throughout the range of variety *axillare* but more rarely.

This variety occurs in Central America, the West Indies, Colombia, British Guiana, and Brazil.

For citation of type material and some discussion of the synonymy see Schubert 1963.

CANAL ZONE: Ft. Kobbe, *Bottimer 1446* (A, DAO). Barro Colorado Island, *Bottimer 1481* (DAO); *Croat 5414, 6353, 7063, Croat 11797* (all MO); *Ebinger 22* (GH, MO); *Kenoyer 384* (US); *Shattuck 1046* (GH, MO). Pipeline Road near Gamboa, *Clewell & Tyson 3209* (FSU, MO), *3210* (MO). Behind Farfan Beach, *D'Arcy & D'Arcy 6087* (MO). 6 mi E of Chepo on Panamerican Highway, *Duke 4074* (MO). Ft. Kobbe, *Duke 4703* (MO). U.S. Army Tropic Test Center, Albrook, *Dwyer 6735* (MO). Gamboa, Naval Reservation, *Ebinger 488* (GH, MO). Río Chagres Bridge, ca. 2 km by road SE of Gamboa toward Balboa, *Lasseigne 4269* (MO). 2 mi N of Paraíso on Balboa Highway, side of hill overlooking Gaillaird Cut, *Lazor & Blum 5321* (SCZ). Altos del Río Pacora, 2500 ft, *Lewis et al. 2300* (GH, MO). Ancón Hill, *Standley 25172* (US). 1 mi N of Summit Garden, *Tyson & Blum 1980* (MO). Across highway from Summit Garden, *Witherspoon & Witherspoon 8696* (MO). CHIRIQUÍ: Between Concepción and David 100–200 m, *Koster 150* (A). COCLÉ: Trail to Las Minas, 2.8 miles NW of church in El Valle de Antón, 3100 ft, *Luteyn 4055* (DUKE). Road from El Valle to La Mesa, 2400–2600 ft, *Vaughan et al. 601* (MO). COLÓN: Colón *Kuntze* (NY); Colón Highway Bridge on Chagres River, *Lazor & Tyson 3029* (MO), *3063* (FSU, MO). DARIÉN: Gold mine at Caná, 500–600 m, *Croat 37584* (MO). Trail between Caná and Boca de Cupe, *Stern et al. 622* (MO). HERRERA: 1 mi N of Las Minas and 14 mi S of Ocú, *Wilbur et al. 12114* (DUKE). PANAMÁ: Roadside near Chepo, *Dodge 10717* (MO). 5–6 mi E of Chepo on Panamerican Highway, *Duke 4045* (GH, MO). Río Pita, 1–2 mi above tidal limit, *Duke 4799* (MO). San José Island, *Duke 12522* (MO, NY, OS); *Erlanson 296* (G, GH, US): *Johnston 98, Johnston 454* (both GH). LOS SANTOS: Loma Prieta, 800–900 m, *Duke 11881* (MO). PROVINCE UNKNOWN: Between Panamá and Sabanas, *Riley 114* (BM, MO, US).

4b. **Desmodium axillare** (Swartz) DC. var. **axillare**.

Desmodium axillare (Swartz) DC., Prodr. 2: 333. 1825.
Hedysarum axillare Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1274. 1806.
Meibomia axillaris (Sw.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.
D. axillare var. *α genuinum* Urb., Symb. Ant. 2: 303. 1900.
Nephromeria axillaris (Sw.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
Meibomia axillaris var. *α. obtusifoliola* Kuntze, Rev. Gen. Pl. 1: 195. 1891.
D. axillare var. *α obtusifoliola* (Kuntze) Urb., Symb. Ant. 4: 291. 1905.
Nephromeria axillaris var. *α. obtusifoliola* (Kuntze) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
Hedysarum reptans Poir. in Lam. Encycl. Méth. Bot. 6: 422. 1804.
Meibomia reptans (Poir.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
D. radicans Macfad., Fl. Jam. 1: 269. 1837. Based on *Hedysarum axillare* Sw.
Meibomia andina Rusby, Mem. Torrey Bot. Club 3: 21. 1893, *pro parte*, as to isotypes (GH, MO, US), not as to holotype (NY).

This, the most common and widespread of the three varieties of *Desmodium axillare*, is distinguished by its rhombic ovate, or rhombic orbicular terminal leaflets, and by the short stipes of its loments (3–4.6 mm) which are exceeded in length by those of the other two varieties.

Desmodium axillare occurs in Mexico, Central America, the West Indies, and the northern ⅔ of South America.

For photographs and discussion of the holotypes of *Hedysarum axillare* and *H. reptans* see Schubert 1963.

BOCAS DEL TORO: Almirante, *Barrus 404* (GH); *Carleton 68* (GH, NY, US), *Carleton 102* (US). Hill above RR station at Milla 7.5, *Croat & Porter 16384* (MO). 1.5 mi SE of Banana Plantation of Changuinola, *Lazor et al. 2458* (FSU, SCZ). Junction of Ríos Changuinola & Terebe, 100–200 ft *Lewis et al. 928* (MO, UC). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2138* (MO, UC). Without other location, *Wedel 225* (GH, MO), Water Valley, *Wedel 621* (GH, MO). CANAL ZONE: Barro Colorado Island, *Dodge 3463, 3478* (both GH). Panamerican Highway, Río Cañita, *Duke 3837* (GH, MO). Near Gatún Dam, *Foster & Chong 1352* (DUKE). Gatún Station, *Hayes 62* (G), *232* (NY). Gamboa, 20–100 m, *Pittier 3763* (NY, US), *Pittier 4439* (US). Las Cascadas Plantation near Summit, *Standley 25792* (US). CHIRIQUÍ: San Bartolo Limite near Costa Rican border, 12 mi W of Puerto Armuelles, 400–500 m, *Croat 22174* (MO). San Bartolo Arriba W of Puerto Armuelles, 125 m, *Croat 26724* (MO). N side of Cerro Pando, 6000 ft, *D'Arcy & D'Arcy 6658* (MO). Quebrada Melliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 453* (MO). Between Río Tinta and Río Tabasara, *Woodson et al. 420* (MO). COCLÉ: 44 km N of Penonomé on road to Coclesito, 300–500 ft, *Hammel 1668* (MO). DARIÉN: Path from Cañazas to Tortí, border Darién and Panamá, *Folsom 4962* (MO). Upper Río Tuquesa, *Le Clezio 208* (MO). El Real, Río Tuira 1 mi down from Pinogana near Quebrada Chuito, *Stern et al. 104* (MO). Bridge over Río Chucunaque downstream from Yaviza, on Panamerican Highway, *Stern et al. 151* (GH). HERRERA: Road between Las Minas and Pesé, 600 ft (U of Fla. site #4), *Duke 12343* (NY). [Variety uncertain: only inflorescence available, no stem or leaves.] PANAMÁ: Near Tapia River, Juan Díaz region, *Maxon & Harvey 6660* (US). PROVINCE UNKNOWN: Bohio Soldado, *Cowell 241* (NY, US).

4c. **Desmodium axillare** var. **stoloniferum** (Rich. ex Poir.) Schubert, J. Arnold Arbor. 44: 289. 1963.

Hedysarum stoloniferum Rich. ex Poir. in Lam., Encycl. Méth. Bot. 6: 421. 1804.
Desmodium spirale β. *stoloniferum* (Rich. ex Poir.) DC., Prodr. 2: 333. 1825.
D. stoloniferum (Rich. ex Poir.) Steud., Nom. Bot. ed. 2. 1: 496. 1840.
D. axillare var. γ. *sintenisii* Urb., Symb. Ant. 2: 303. 1900.
Meibomia sintenisii (Urb.) Britt. in Britton & Wilson, Sci. Surv. Porto Rico & Virgin Isl. 5: 402. 1924.
Nephromeria axillaris var. γ. *sintenisii* (Urb.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 284. 1924.
D. axillare var. *sintenisii* sensu Schubert, Contr. Gray Herb. 135: 84–86, *pl. 1, figs. A1–7*. 1941.
Meibomia albida Blake, Contr. U.S. Natl. Herb. 24: 5. 1922.

The variety *stoloniferum* is intermediate in aspect between var. *axillare* and var. *acutifolium*. From both these varieties it may be distinguished by its ovate, abruptly short acuminate leaflets, and from var. *axillare* by the denser pilosity on the abaxial surface of the leaflets as well as by its longer pedicels and loment stipes.

Central America, the Greater Antilles, and the northern half of South America.

CANAL ZONE: Barro Colorado Island, *Croat 6290, 6630* (both MO), *10214* (MO, SCZ), *11254, 11264, 11311, 11828, 14019, 14982, 15118* (all MO); *Foster 828* (DUKE); *Knight* (WIS); *Netting 47* (MO); *Starry 168* (MO); *Wilbur & Weaver 10812* (DUKE, GH, MO). Behind Farfan Beach, *D'Arcy & D'Arcy 6087* (MO). Jenine, Río Cañita, *Duke 3871* (MO). Río Indio, *Steyermark & Allen 17436* (MO). CHIRIQUÍ: San Bartolomé, Peninsula de Burica, 0–50 m, *Woodson & Schery 873* (MO, NY, US). COLÓN: Gatún Lake, Goodyear All Weather Estate, *Seibert 1526* (US). DARIÉN: El Punteadero, bridge crossing of Panamerican Highway over Río Chununaque, down river from Yaviza, *Stern et al. 151* (MO). LOS SANTOS: Loma Prieta, Cerro Grande, 2400–2800 ft, *Lewis et al. 2210* (MO). PANAMÁ: Río Sancantí, 2 mi upstream from Piria, 120 m, *Duke 14384* (NY). From Tortí to the Pilota del Toro, mountain overlooking Tortí Arriba, *Folsom et al. 5098* (MO). Juan Díaz, *Killip 3161* (US). SAN BLAS: Between Cangandí and Mandinga Indigena, *Duke 14756* (NY, OS).

5. **Desmodium barbatum** (L.) Benth. in Miq., Pl. Jungh. 224. 1852; Benth. & Oerst. in Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn. 1853: 18. 1854.

Hedysarum barbatum L., Syst. Nat., ed. 10. 1170. 1759. TYPE: herb. Linnaeus (LINN 921.48; microfiche A-GH).
Perrottetia barbata (L.) DC., Ann. Sci. Nat. 4: 96. 1825.
Nicolsonia barbata (L.) DC., Mém. Légum. 313. 1826.
Urania barbata (L.) Desv., Mém. Soc. Linn. Paris 4: 309. 1826.
Meibomia barbata (L.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.

Herbs, prostrate to ascending or erect with white to fulvous appressed to spreading pilosity on stems, branches, petioles, and rachis of the inflorescence. *Leaves* usually trifoliolate, stipulate, petiolate; stipules conspicuous and persistent, deltoid attenuate, slightly auriculate at the base, striate and ciliate, somewhat pilose to glabrescent on abaxial surface, 6–10 mm; petioles sulcate on adaxial surface, 0.8–2.2 cm long, the leaf rachis similar, 0.2–0.7 cm long; stipels slender, ciliate, persistent, 1.5–4.5 mm; petiolules somewhat stouter and more densely pilose than leaf rachis, 1–2 mm long; leaflets almost orbicular to oval, elliptic obtuse or obovate, usually mucronate, often retuse, sparsely appressed pilose adaxially, densely so and with venation prominent abaxially, terminal leaflets 1.4–5 cm long, 0.5–2 cm wide, the lateral leaflets 1–3.8 cm long, 0.4–1.3 cm wide. *Inflorescence* of axillary and terminal short, congested, densely flowered racemes somewhat obscured by the long pubescence of bracts and calyces; bracts long persistent, ovate acuminate, striate, pilose to glabrescent on abaxial surface, ciliate, 5–7 mm long, 1.5–2 mm wide, secondary bracts lacking; pedicels uncinulate pilosulous, 3.5–9 mm long. *Flowers* with the calyx becoming reflexed, subequally 5-lobed, silky pilose, the lobes ciliate, 4–6 mm long; standard obovate, somewhat unguiculate, 4–5 mm long, 2–3.7 mm wide, the wings oblong, obtuse, short unguiculate, 3–4 mm long, 1–1.5 mm wide, the keel petals scythe shaped, truncate at the apex, long unguiculate, 3–4.5 mm long, 0.8–1 mm wide at the apex. *Loment* 1–5-articulate, straight on the dorsal suture, somewhat curved below between the wide isthmi, uncinulate pubescent on the surfaces; articles separating partially first, the lower suture dehiscing later, the articles 2–3.5 mm long, 2–2.5 mm wide; *seed* subquadrate to quadrate, 1.5 mm long, 1 mm wide, pale tan.

A polymorphic species widespread in tropical areas of the New World and in Africa and Asia.

Many variations have been named but in general the characters cannot be correlated with geographical distribution. In Panama there seem to be two forms, one repent and one erect, but there are many intergradations between the two extremes.

BOCAS DEL TORO: Almirante, *Rowlee & Stork 1000* (NY, US). Chiriquí Lagoon, *Wedel 1179* (GH, MO, US). Johns Creek, *Wedel 2758* (GH, MO, NY, US). CANAL ZONE: 1 mi from Miraflores, *Blum 1853* (FSU, SCZ). Summit Gardens, *Bottimer 1507* (DAO). Venado Beach, *Correa & Gonzalez 507* (A, DUKE, SCZ); *Correa & Gonzalez 524* (DUKE, FSU, MO). Near Summit Golf Course, *Croat 12792* (MO). 1 mi N of Summit Garden, *Croat 12891* (MO). Pipeline Road to 18 km N of Gamboa, *D'Arcy* (MO). Toro Point, Ft. Sherman, *Duke 4323* (MO). Paraiso, *Dwyer 7163* (MO). Fort Sherman, *Dwyer 7167* (MO). Chagres, *Fendler 76* (K, MO, US). Pipeline Road, 2–4 mi N of Gamboa, *Gentry 6536* (GH, MO). Empire Station, *Hayes 585* (K). Paraiso Station, *Hayes 799* (NY). Cerro Ancón,

Heriberto 129 (GH, US). 8 mi N of Gamboa on Pipeline Road, *Lazor 5276* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5661, 5684* (both MO). 3 km S. Gualaca, *McCorkle C-46* (FSU, SCZ). Near Gamboa Country Club, *Mori 413* (MO). Ancón Hill, *Piper 5116* (US). Culebra, 50–150 m, *Pittier 2142* (BM, C, NY, US), *4827* (NY, US). *Seemann 229* (BM, K), [Province uncertain]. Sosa Hill, Balboa, *Standley 25273* (MO, US). Ancón Hill, *Standley 26354* (C, US). Summit, *Standley 26948* (US). Frijoles, *Standley 27658* (US). Mt. Hope Cemetery, *Standley 28788* (US). Cerro Azul, 2000 ft, *Tyson 2128* (MO). Curundu, *Tyson & Blum 2523* (FSU, MO). 1 mi from Summit on road to FAA radar tower, *Tyson et al. 2771* (MO, SCZ). CHIRIQUÍ: Near Veladero, site 60, 0–100 m *Burt & Koster 125* (MO). Savanna just below Boquete, 800 m, *D'Arcy 9769* MO). Lava fields near town of Volcán, 4600 ft, *Duke 9215* (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 602* (GH, MO). Road to Gualaca 0–100 m, *Rattray 125* (A). Boqueté District, Volcancitos, 5500 ft, *Terry 1262* (GH, MO). COCLÉ: S of El Valle de Antón, 600–800 m, *Allen 2810* (G, GH, MO, US); *Bottimer 1473* (A, DAO). Savanna 4–6 mi E of Natá, 10–25 m, *Duke 12388* (NY). Penonomé, *Ebinger 995* (GH, MO); 50–1000 ft, *Williams 128* (NY, US). COLÓN: Portobelo Road ca. 1 mi W of Portobelo, *Gentry 1739* (MO, SCZ). DARIÉN: El Real, *Burch et al. 1069* (GH, MO, UC). HERRERA: Near Ocú, 100–200 m, *Burt & Koster 88* (MO). Between Panamerican Highway and Ocú, 100–200 m, *Koster 88* (A). PANAMÁ: Pacora, ca. 35 m, *Allen 990* (GH, MO, US). Cerro Campana, *D'Arcy 9581, 9602* (both MO). Between Panamá and Chepo, *Dodge et al. 16701* (MO). Cerro Campana, *Duke 5949* (MO). Tocumen area, *Dwyer et al. 7231* (GH, MO). Las Sabanas, *Heriberto 138* (US). Tumba Muerto, *Heriberto 176* (NY). Sabanas near Chepo, 30 m, *Hunter & Allen 19* (MO). Chilibre, *Jaén 45* (MO). San Jose Island, *Johnston 27* (US, MO), *672, 826* (both GH). Taboga Is., 200 m, *Killip 3187* (US). Between Tapía and Tocumen Rivers, 75 m, *Killip 3239* (US). Cerro Campana, *Lewis et al. 3131* (MO). Taboga Island, *Longfield 490* (BM, K, MO, US). Cerro Campana, 650–700 m, *McDaniel 8138* (FSU). Pacora-Chepo highway, vicinity Pacora River, *McDaniel 8179* (DUKE, FSU). El Llano-Cartí road, 5 km N of Panamerican Highway, 300 m, *Nee 7929* (DUKE, MO). Sabanas, *Paul 52* (US). Sabana de Juan Corso, near Chepo, 60–80 m, *Pittier 4647* (G, GH, NY, US). Matías Hernández, *Pittier 6873* (GH, NY, US). Nuevo Emperador, *Puga 30* (DUKE, MO). Road to Chepo near sea level, *Semple Pa-1* (US). Big swamp east of Río Tocumen, *Standley 26505* (US). Near Matías Hernández, *Standley 28887* (US). Between Matías Hernández and Juan Díaz, *Standley 32084* (US). Cerro Azul at 2000 ft, *Tyson 2128* (FSU, SCZ). W slope Cerro Campana, 2500 ft, *Tyson et al. 2347* (FSU, SCZ). Between Pacora and Chepo, 24 m, *Woodson et al. 1662* (GH, MO, NY, US). SAN BLAS: Mainland in front of Ustupo, *D'Arcy 9497* (MO). Mainland Point opposite Isla Mosquito, *Duke 8972* (DUKE, MO, OS). Mainland opposite Playon Chico, 0.3 mi from Caribbean, 0.200 m, *Gentry 6341* (MO). VERAGUAS: Divisa/Santiago, 0–100 m *Burt & Rattray 77, 81* (both MO). Near La Peña, 100–200 m alt., *Burt & Koster 107* (MO). Savanna 10 mi W of Santiago, *Duke 13646* (OS), *A13647* MO). Panamerican Highway ½ km W of Hwy. 50 turnoff to Ocú., 30 m, *Nee 8000* (MO). Above Río Santa María, road to Santiago, 5 km S of Santa Fe, 250–300 m, *Nee 8130* (FSU, GH, MO). Near Santiago, 0–100 m, *Rattray 81* (A).

6. **Desmodium cajanifolium** (H.B.K.) DC., Prodr. 2: 331. 1825.

Hedysarum cajanifolium H.B.K. Nov. Gen. Sp. Pl. 6: 410 (folio ed.); 525 (quarto ed.). *pl. 598.* 1824. TYPE: Amérique Equatoriale, Herb. *Humboldt & Bonpland* (P, holotype; GH, photo).

Hedysarum multiflorum Willd. ex. Schlecht. & Cham. Linnaea 5: 586. 1830; G. Don, Gen. Syst. 2: 292. 1832, nomen nudum. TYPE: Colombia, *Humboldt* (B-Willd 13797; microfiche A-GH).

Meibomia cajanifolia (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.

Herbs or *shrubs,* not much branched, 2–4 m high; stem terete, striate, densely uncinulate pubescent and pilose. *Leaves* trifoliolate, stipulate, short petiolate; stipules obliquely ovate, long attenuate, striate, ciliate, pilose and puberulent, early deciduous, ca. 4 mm long and 2 mm wide; petioles narrowly sulcate, densely uncinulate pubescent and pilose, 0.7–1 cm long; the leaf rachis similar, 0.6– 0.7 cm long; stipels lance attenuate, striate, ciliate, to 3.5 mm long; petiolules densely pilose to 2.5 mm long; leaflets narrowly ovate, obtuse and mucronate at the apex, cuneate to obtuse at the base, lustrous on the adaxial surface, pilose along the midrib and with scattered puberulence, duller and rather densely pilose abaxially; terminal leaflets 5–9 cm long, 1.6–3.3 cm wide, lateral leaflets 3.3–6 cm long, 1.3–2.5 cm wide. *Inflorescence* terminal and axillary, racemose to racemose paniculate, much branched and densely flowered; rachis somewhat angulate, uncin-

ulate pubescent; bracts early deciduous, primary bracts ovate acuminate, striate, puberulent, ciliate, each subtending 2 pedicels, 2–3.5 mm long, 0.5–1.5 mm wide; secondary bracts each subtending 1 pedicel (laterally), subulate, ciliate, to 1 mm long; pedicels slender, ascending, short spreading pilose, 5–6 mm long. *Flowers* with the calyx bilabiate, pilose and puberulent throughout, the teeth of both lobes ciliate; central tooth of lower lobe lanceolate to lance attenuate, 3–4 mm long, lateral teeth acute to obtuse, 2.5–3.5 mm long, the upper lobe only slightly bifid, 2.5–3.5 mm long; petals, especially the standard, papillate, the standard obovate, retuse, narrowed to the cuneate base, 5.5–8 mm long, 2–3 mm wide, the wings oblong, auriculate, unguiculate, equalling standard in length and width (above claw), the keel petals obliquely oblong, long unguiculate, equalling standard in length, 1.5–2 mm wide. *Loment* to 6-articulate, stipitate, stipe pilose to 3.5 mm long, but not exceeding calyx, articles obtusely triangular, isthmi narrow and eccentric, margins pilose, surfaces uncinulate puberulent and pilose, 5–6 mm long, 4–4.5 mm wide; seed obtusely oblong, 2 mm long, 1.3 mm wide.

This species is scattered in southern Mexico and Panama, the West Indies and the northern half of South America.

The plants are handsome, easily distinguished by their lustrous leaflets, densely flowered inflorescences, and short pedicellate flowers and loments.

BOCAS DEL TORO: *Carleton 217* (US). CANAL ZONE: W end of Gatun Lake Dam, *Blum & Tyson 1973* (FSU, MO), *B 1973* (SCZ). Frijoles, *Bottimer 1487* (A, DAO). Gamboa, *Bottimer 1620* (DAO). Between Goofy Lake in Cerro Azul and Main Highway, *Correa & Dressler 441* (DUKE, FSU, MO, SCZ). Gamboa Navy Pipeline, *Correa & Haines 531* (MO). Barro Colorado Island, *Croat sn-213* (MO); *Shattuck 561* (MO). 1 mi N of Paraiso near Gaillard Cut, *Croat 12653* (SCZ). 1 mi N of Summit Garden, *Croat 12890* (MO). Road to geologic test site north of Paraiso, *Croat 12971* (MO). Gaillard Highway near Paraiso, *Croat 13148A* (MO). Frijoles, *Foster 2056* (DUKE, GH, MO). Frijoles, *Busey & Croat 251* (MO). Ancón, *Greenman & Greenman 5069* (MO). Gamboa, *Greenman & Greenman 5170* (MO). Near Miraflores Locks, *Greenman & Greenman 5182* (MO). Between Summit and Gamboa, *Greenman & Greenman 5253* (MO). Paraiso Station, *Hayes 20* (NY). Summit road, *Jones 276* (MO, US). 3 mi N of Paraiso on the Balboa Highway, *Lazor & Blum 5324* (SCZ). Roadside ½ mi NW of Gamboa, 70 m, *Liesner 1401* (MO). Along RR, 1½ km W of Gamboa, 30 m, *Nee 9477* (MO). Headwaters of Río Providencia, 7.5 km SW of Gatún Dam, 25–140 m, *Nee & Gentry 8654* (MO). Empire to Mandinga, *Piper 5192, 5193* (both US). Gamboa, *Piper 5195* (SU). El Paraíso, 30–100 m, *Pittier 2519* (US). Gamboa, 40–80 m, *Pittier 4808* (BM, US). Between Panamerican Highway and Cerro Campana, *Porter et al. 4867* (MO). Cerro Gordo, near Culebra, *Standley 26044* (US). Summit, *Standley 26947* (MO, US). Frijoles, *Standley 27659* (US). Gamboa, *Standley 28336* (US). Old Las Cruces Trail between Ft. Clayton and Corozal, *Standley 29151* (US). Las Cascadas Plantation near Summit, *Standley 29615* (US). Río Pedro Miguel near East Paraíso, *Standley 30028* (US). Obispo, *Standley 31665* (US). 1 mi N of Summit on road to FAA tower, *Tyson & Blum 2751* (SCZ). Miraflores Lake, *White et al. 59* (US). Pipeline Road NW of Gamboa about 6 mi, *Wilbur & Teeri 13348* (DUKE). Pipeline Road N of Gamboa, *Wilbur & Weaver 11243* (DUKE). CHIRIQUÍ: 1 mi N of Limones, *Croat 22116* (MO). COCLÉ: El Valle, 800–1000 m, *Allen 85* (GH, MO, US); 600 m, *Allen 2774* (G, GH, MO, US). Between Las Tibias and El Copé, *Folsom & Collins 6426* (MO). COLÓN: Near Salamanca, 8 mi E of Transisthmian highway, 100 m, *Gentry 6710* (MO). PANAMÁ: Pacora, 35 m, *Allen 989* (GH, MO, US). San Carlos, 0–10 m, *Allen 1146* (MO). 2 km de Cañita, carretera hacia la Represa de Bayano, *Escobar & Escobar 273* (MO). Las Sabanas, *Heriberto 283* (NY, US). Río Tocumen N of Chepo road, *Hunter & Allen 250* (GH, MO). Juan Díaz, *Lara 42* (DUKE, MO). 2 km S of Alcalde Díaz, 200 m, *Nee 8895* (DUKE, MO). Sabanas, NE of Panama City, *Paul 186* (US). Las Cumbres (Peñoncito) *Puga 51* (MO). Between Las Sabanas and Matías Hernández, *Standley 31830, 31862* (both US). VERAGUAS: Near Pajal, 280 m, *Burt & Koster 109* (MO). Near Pajal between Santiago and Tolé, 100–200 m, *Koster 109* (A). Quebrada El Nance at the Santiago-Santa Fé road bridge, 11 km S of Santa Fe, 220 m, *Nee 8159* (DUKE, MO) PROVINCE UNKNOWN: *Duchassaing s.n.* (P); *Duke 6171* (MO); *Halstead 18* (K, NY); *Seemann 458* (BM, GH, K, S).

7. **Desmodium campyloclados** Hemsl., Biol. Centr.-Amer. Bot. 1: 276. 1880. TYPE: Nicaragua. Segovia, *Oersted* (K, holotype; GH, photo).

Meibomia campyloclada (Hemsl.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. sylvestris Blake, Bot. Gaz. 78: 273. 1924. TYPE: Colombia, Dept. Huila, Cordillera Oriental, E of Neiva, *Rusby & Pennell 577* (NY, holotype; GH, photo).
Desmodium immerens Macbr., Field Mus. Nat. Hist., Bot. Ser. 11: 23. 1931. TYPE: Peru, Yanano, 6000 ft, *Macbride 3725* (US, holotype; GH, photo).
D. flexuosum Pittier, [Leguminosas de Venezuela], Bol. Tecn. 5, Minist. de Agric. y Cria, Serv. Bot. 26. 1944, without Latin diagnosis or citation of type. (See discussion below.)
D. dubium Pittier, Bol. Soc. Venez. Ci. Nat. 11: 17. 1947. (See discussion below.)

Sprawling *herb* to slender straggling *shrub*, to 3 m or more, branches slender and elongate; stem and branches striate, soft pubescent with upwardly appressed pilosity. *Leaves* trifoliolate, stipulate, petiolate; stipules ovate attenuate, the slender apex equaling or exceeding the basal portion, stramineous, striate, pilose on the abaxial surface, ciliate, not persistent, 5 mm long, 1.5 mm wide; petioles sulcate, striate, with upwardly appressed pilosity shorter than that of stem, 2.5–5 cm long; leaf rachis similar, 1.5–2 cm long; stipels lance attenuate, puberulent and ciliate, 2.5–3.5 mm long; petiolules darker, stouter than the leaf rachis, spreading pilose, 2–3 mm long; leaflets mucronulate, thin, moderately appressed pilose on both the surfaces, the terminal leaflet ovate, obtuse at apex, cuneate at base, 6–6.7 cm long, 3–4 cm wide; lateral leaflets similar or somewhat rounded at the base, 5–5.5 cm long, 2.5–3 cm wide. *Inflorescence* axillary, racemose, lax; rachis spreading pilose and puberulent; pedicels borne in bracteate fascicles of 3–many with 2 lateral flowers developing first, the central 1 following, etc.; bracts early deciduous, the primary bracts narrowly ovate attenuate, striate, ciliate, puberulent and pilose over the abaxial surface, 4–4.5 mm long, 1–1.5 mm wide; secondary bracts similar, smaller, to 1.8 mm long, 0.2 mm wide; pedicels lax, finely puberulent, 12–19 mm long. *Flowers* with the calyx somewhat puberulent throughout, teeth of both lobes ciliate and somewhat pilose, especially central tooth of the lower lobe, all teeth of lower lobe 3 mm long, the upper bifid lobe 3 mm long; corolla with standard obovate, retuse, cuneate at the base, to 8.5 mm long and 6 mm wide, wings oblong, obtuse, short unguiculate, 7–7.5 mm long, 2.5 mm wide, keel petals narrowly oblong, truncate at the apex, unguiculate ca. ⅓ their length, 8–9 mm long, 2 mm wide. *Loment* to 5-articulate, stipitate, stipe 3 mm long; articles triangular, the upper suture slightly curved, the lower suture rather deeply indented at isthmi, uncinulate pubescent throughout, to 8 mm long and 4.5 mm wide; mature seeds not seen.

Desmodium campyloclados ranges from Central America south to Colombia, Venezuela, and Peru.

The slender pedicels and relatively large loment articles distinguish *Desmodium campyloclados*. This species is related to *D. procumbens* and *D. tortuosum* in the structure of its inflorescence; it differs from both these species in the shape of the loment articles and in having the isthmi between the articles eccentric.

The two species of Pittier cited in the synonymy of *Desmodium campyloclados*, *D. flexuosum* and *D. dubium*, seem to be equivalent to it. Both species are probably based on a collection from "around Canaguá, 1,500 m, State of Merida,

Venezuela, Nov. 10, 1943, legit V. M. Badillo n. 578." of which a fragment is in the Gray Herbarium. The type of *Desmodium dubium* was cited by Pittier as *Badillo 598* with the same locality and date of collection as *Badillo 578*. I think that the latter number was undoubtedly intended. The packet in which *Badillo 578* was sent by Pittier bears still another epithet, fortunately never published.

CHIRIQUÍ: Cerro Punta, Volcán de Chiriquí, 5500 ft, *Bottimer 1531* (A, DAO). Río Chiriquí Viejo north Volcán City, *Duke 9014* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5265* (FSU, SCZ), collection very immature, placed here with doubt.

8. **Desmodium distortum** (Aubl.) Macbr., Field Mus. Nat. Hist., Bot. Ser. 8: 101. 1930.

Hedysarum distortum Aubl., Hist. Pl. Guiane 2: 774. 1775. TYPE: French Guiana. *Aublet* (BM, holotype; GH, US, photo).
H. asperum Poir. in Lam., Encycl. Méth. Bot. 6: 408. 1804. TYPE: locality unknown according to Poiret (P-JU, holotype; GH, photo).
Aeschinomene aspera (Poir.) St. Hilaire, J. Bot. (Desvaux) 1: 60. 1813.
Desmodium asperum (Poir.) Desv., J. Bot. (Desvaux) 1: 122. 1813.
D. rubiginosum Benth., Ann. Nat. Hist. 3: 434. 1839. TYPE: British Guiana, Berbice, *Schomburgk 217* (K, holotype; G, isotype; GH, photo).
D. spectabile Miq., Linnaea 18: 570. 1844. TYPE: Surinam, Para, Onoribo, *Focke 880* (U, holotype; GH, photo).
Meibomia aspera (Poir.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
M. distorta (Aubl.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 281. 1926, not Schindl., Repert. Spec. Nov. Regni Veg. 20: 148. 1924.

Herbs or *shrubs*, to 3 m tall, branching mostly above, the stem slender, terete to subangulate, reddish, abundantly uncinulate puberulent and moderately long pilose with attenuate trichomes. *Leaves* trifoliolate, stipulate, and petiolate; stipules essentially amplexicaul, obliquely ovate attenuate, long ciliate, striate, puberulent and somewhat pilose on both the surfaces to glabrescent, soon reflexed, long persistent, 6–15 mm long, 3.5–6 mm wide; petioles sulcate, densely uncinulate puberulent and moderately pilose, 1.3–8 cm long; leaf rachis similar, 0.7–3 cm long; stipels elliptic attenuate, striate, ciliate, puberulent on abaxial surface, 4–11 mm long, to ca. 2 mm broad; petiolules somewhat stouter than the leaf rachis, densely pilose, 1.5–5 mm long; leaflets elliptic to ovate, mostly obtuse and apiculate, obtuse at the base, uncinulate puberulent and appressed pilose on the adaxial surface, prominently reticulate and abundantly soft pilose on the abaxial surface, rather densely ciliate, terminal leaflet 3.7–17 cm long, 2–6 cm wide, lateral leaflets 2–11 cm long, 1.5–5 cm wide. *Inflorescence* racemose paniculate, composed mostly of densely flowered slender, elongate racemes, the pairs of pedicels at maturity usually less than 1 cm apart; rachis ridged and grooved, densely patent pilose with slender trichomes glandular at the base and also uncinulate puberulent; primary bracts each subtending 2 pedicels, each of these further subtended by a secondary bract, slenderly ovate attenuate, striate, pilose, ciliate, finely puberulent within, soon deciduous, 2.5–5 mm long, 0.5–1.2 mm wide, secondary bracts similar, slenderer, 1–1.7 mm long, 0.2–0.5 mm wide, also quickly deciduous; pedicels slender, ascending, glandular pilose, 6–10 mm long. *Flowers* with the calyx bilabiate, glandular puberulent throughout and somewhat pilose, the teeth finely ciliate, the upper lobe orbicular, slightly bifid, 2–2.5 mm long, the central tooth of the lower lobe deltoid acuminate with stout pilosity

along its midrib, 2.5–3.5 mm long, the lateral teeth acute, 2.5 mm long; corolla rose purple to greenish purple, the standard obovate, acute at the base, 5–6 mm long, 3–4.5 mm wide, the wings oblong, obtuse, auriculate, 4.5–6 mm long, 1.5–2.5 mm wide, the keel petals scythe shaped, long unguiculate, 5–7 mm long, 1–2 mm wide. *Loment* stipitate, to 6-articulate, stipe 1.5–2 mm long; articles orbicular or nearly so but often becoming variously involuted, 1.5–2.5 mm long, 1.5–2 mm wide; seeds quadrate, obtuse at the ends, reddish brown, 2 mm long, 1 mm wide.

This species occurs from Mexico to northern South America.

It is not entirely clear whether *Desmodium hirsutum* Mart. & Gal. (1843) of Mexico is distinct from *D. distortum*. More Mexican material must be studied before a satisfactory conclusion can be reached. Should the two elements prove to be the same, *Desmodium distortum* (Aubl.) Macbr. is the name to be maintained for them. (See Standley & Steyermark 1946, under *Desmodium hirsutum* Mart. & Gal.).

CANAL ZONE: Across railway track from Summit Gardens, *Bottimer 1512* (A, DAO). Cocoli Road, *Burch et al. 1391* (GH, MO). Venado Beach, *Correa & Gonzalez 506* (A, SCZ). Hill S of Pedro Miguel Locks, *Croat 9175* (MO). Summit Naval Radio Station, *Croat 14241* (MO). Cocoli, *Dwyer 7209* (MO). Ancón, *Greenman & Greenman 5078* (MO). Gamboa, *Heriberto 94* (GH, US). Government forest, Las Cruces Trail, 75 m, *Hunter & Allen 711* (GH). La Boca, *Mori & Kallunki 3678* (MO). Ancón, *Piper 5186* (US). Around Culebra, 50–150 m, *Pittier 2233* (US). Balboa, *Standley 26400, 27155* (both US). Corozal, *Standley 27393* (US). Río Pedro Miguel near East Paraíso, *Standley 30037* (US). Balboa, *Standley 32138* (US). Curundu, *Tyson 3478* (FSU, MO, SCZ). Miraflores Lake, *White 59* (US). CHIRIQUÍ: 10 mi W of Puerto Armuelles, 100–300 m, *Liesner 90* (MO). Near Remedios, 0–100 m, *Koster 167* (A). 6 mi W of San Lorenzo, *Wilbur et al. 15473* (Duke). COCLÉ: Panamerican Highway and Río Teta, *Blum & Tyson 1890* (FSU, MO, SCZ). 3 mi NE of Antón, *D'Arcy & Croat 4102* (MO). Río Hato, 0–100 ft, *Rattray 43, 47* (both A). Penonomé, 50–1000 ft, *Williams 117* (NY). HERRERA: Ocú, 100 m, *Allen 4043* (MO). Road from La Avena to outskirts of Pesé, 200 ft, *Burch et al. 1275* (GH, MO). Between Santa María and Parita, 0–100 m, *Koster 119* (A, MO). Roadside, 10 mi S Ocú, *Tyson et al. 2812* (MO, SCZ). PANAMÁ: 500 m del Río Trapichito (La Chorrera), *Aguilera 15* (DUKE, MO). Avenida Eloy Alfaro (Tumba Muerto), *Carrasco 15* (MO). Campo Experimental de Monte Oscuro, 10 m, *Correa 1938* (MO). Taboga Island, *Dwyer 2813* (MO, SCZ). Cerro Jefe, 3100 ft, *Dwyer 8505* (MO). 500 m del Río Trapichito (La Chorrera), *Aguilera 15* (DUKE, MO). Taboga Island, *Hinds* (K); *Macbride 2816* (US). VERAGUAS: 1 mi W of Santiago along old Interamerican Highway, *Tyson 5172* (FSU, SCZ).

9. **Desmodium glabrum** (Mill.) DC., Prodr. 2: 338. 1825.

Hedysarum glabrum Mill., Gard. Dict., ed. 8. no. 12. 1768. TYPE: Mexico. Campeachy. *Houstoun* (BM, holotype; GH, photo).

H. molle Vahl, Symb. Bot. 2: 83. 1791. TYPE: ex insula St. Crucis, misit Dr. Pflug (C, holotype; GH, photo).

H. terminale Rich., Actes Soc. Hist. Nat. Paris 1: 112. 1792. TYPE: Cayenne. *LeBlond* (G, probable isotype; GH, photo).

H. emarginatum Poir., in Lam., Encycl. Méth. Bot. 6: 412 [no. 45]. 1804. TYPE: Martinique, herb. Lamarck (P-LAM. 307; GH, photo).

Desmodium molle (Vahl) DC., Prodr. 2: 332. 1825.

D. terminale (Rich.) DC., Prodr. 2: 327. 1825.

D. emarginatum (Poir.) DC., Prodr. 2: 338. 1825.

Meibomia glabra (Mill.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. mollis (Vahl) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. terminalis (Rich.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

M. emarginata (Poir.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Desmodium campestre Brandegee, Univ. Calif. Publ. Bot. 6: 43. 1914. TYPE: Mexico. Oaxaca, Picacho-San Geronimo, *Purpus 6810* (UC, holotype; GH, isotype).

Herb, erect, to 2 m; stem mostly simple, striate, grooved, densely uncinulate pubescent, pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules ovate, abruptly long attenuate, slightly auriculate at the base, striate, puberulent and pilose on abaxial surface, ciliate, usually turning dark purplish and becoming reflexed, persistent, to 6.5 mm long and 3 mm wide; petioles sulcate on adaxial surface, striate to ridged and grooved, densely uncinulate pubescent and somewhat pilose, to 3 cm long, leaf rachis similar, ca. 1 cm long, stipels lance attenuate or slightly broader, ca. 4 mm long; petiolules somewhat stouter than the leaf rachis, densely pilose, 1.5–2.5 mm long; leaflets slightly uncinulate puberulent especially along the midrib above, and abundantly pilose to tomentose on both the surfaces, terminal leaflet ovate acute, rounded to cuneate at the base, to ca. 7.5 cm long, 4.5–4.8 cm wide, lateral leaflets similar, slightly oblique, usually rounded at base, 3.5–5 cm long, 2.5–3 cm wide. *Inflorescence* racemose paniculate, often much branched, rachis striate, uncinulate puberulent and with somewhat glandular trichomes in addition; primary bracts narrowly ovate acuminate, striate, puberulent, and ciliate, 2.5 mm long, 0.5–0.7 mm wide, each subtending a fascicle of 3 to several pedicels; secondary bracts similar, smaller, each subtending a single pedicel, 0.8–1.3 mm long, 0.3–0.5 mm wide, all bracts early deciduous; pedicels with pubescence similar to that of rachis, 5–7 mm long; calyx puberulent throughout and moderately stiff pilose, the teeth of both lobes ciliate, the central tooth of the lower lobe 2–2.7 mm long, the lateral teeth 2–2.5 mm long, the upper bifid lobe 2–2.5 mm long; corolla with standard narrowly obovate tapering to an acute base, 2.5 mm long, 1.5 mm wide, the wings obliquely oblong, broadest at the apex and slightly auriculate at the base, unguiculate, to 2.5 mm long, 1 mm wide, keel petals scythe shaped, scarcely auriculate, narrowed to the claw, to 2.5 mm long and 0.7 mm wide. *Loment* almost sessile, to 3-articulate, the terminal article enlarged and flattened, essentially elliptic except for slight indentation over seed, uncinulate pubescent becoming glabrous except on suture at maturity, with reticulate venation prominent, subterminal articles quadrangular with alternate margins folded in or back and appearing twisted, uncinulate puberulent; *seed* transversely elliptic, 2 mm long, 1 mm wide.

This species occurs in Mexico, the West Indies, the northern half of South America and the Galapagos Islands.

CANAL ZONE: Farfan Beach area, *Tyson & Blum 2604* (FSU, SCZ). CHIRIQUÍ: Alanje/David, 0–100 m, *Burt & Koster 151* (MO). COLÓN: Punta Chame, *D'Arcy 10237* (MO). PANAMÁ: La Exposición, *Heriberto 276* (US). Bella Vista, *Standley 25401* (US). Panama City, *Seemann 219* (GH, K, S); *Seemann* (BM).

10. **Desmodium incanum** DC., Prodr. 2: 332. 1825. TYPE: Plumier, Ic. 149. *Fig. 1*. 1757.

Hedysarum canescens Mill., Gard. Dict., ed. 8. 1768. Based on *Hedysarum triphyllum fruticosum supinum* . . . . Sloane, Voy. 1: 185, *tab. 118, fig. 2*. 1707, non *Hedysarum canescens* L. (1753).
H. racemosum Aubl., Hist. Pl. Guiane 2: 774. 1775, non *Desmodium racemosum* DC. (1825). Based on Plumier, Ic. 149. *fig. 1*, 1757.
H. frutescens sensu Jacq., Hort. Bot. Vindob. 3: 47. *tab. 89*. 1776, non L. 1753 (=*Lespedeza*).
H. supinum Swartz, Prodr. 106. 1788; Fl. Ind. Occ. 3: 1264. 1806, non *H. supinum* Chaix ex Villars (1779).
H. incanum Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1265. 1806, non *H. incanum* Thunb. (1784).

H. canum J. F. Gmelin, Linn. Syst. Nat., ed. 13. 13(3): 1124. 1791. Based on Plumier, Ic. 149. *fig. 1*. 1757. Illegitimate renaming of *H. racemosum* Aubl.
H. canum Lunan, Hort. Jam. 305. 1814. Renaming of *H. incanum* Sw.
Aeschynomene incana (Swartz) G. F. Meyer, Prim. Fl. Esseq. 245. 1818, not Vog. (1838).
Desmodium racemiferum DC., Prodr. 2: 331. 1825. Based on *Hedysarum racemosum* Aubl., non Thunb. (1784), nec *Desmodium racemosum* DC. (1825).
Meibomia adscendens (Swartz) DC. var. *β incana* (Sw.) Kuntze, Rev. Gen. Pl. 1: 195. 1891.
M. incana (Swartz) Vail, Bull. Torrey Bot. Club 19: 118. 1892.
M. supina (Swartz) Britton, Ann. New York Acad. Sci. 7: 83. 1892.
Desmodium supinum var. *amblyophyllum* Urb., Symb. Ant. 7: 229. 1911. LECTOTYPE: Dominican Republic: Santo Domingo prope Constanza, *Tuerckheim 3183* (NY).
D. canum (J. F. Gmelin) Schinz & Thellung in Schellenb., Schinz & Thellung, Mem. Soc. Neuchatel 5: 371. 1913; Repert. Spec. Nov. Regni Veg. 12: 428. 1913.
Meibomia cana (J. F. Gmelin) S. F. Blake, Bot. Gaz. 78: 276. 1924.
Desmodium frutescens Schindl., Repert. Spec. Nov. Regni Veg. 21: 9. 1925. Based on *Hedysarum frutescens* sensu Jacq., non L. 1753 (=*Lespedeza*).

Suffruticose to shrubby; stem to 3 m tall, ascending to generally erect, terete to subangulate, uncinulate puberulent to pubescent and somewhat pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate acuminate, striate, puberulent and pilose on the outer surface, ciliate, at least partially connate on the opposite side of the stem from the petiole, long persistent, 6–10 mm long, 1–2 mm wide; petioles sulcate adaxially, uncinulate puberulent and long spreading pilose, 1.3–3.5 cm long; leaf rachis similar, shorter, to 1.5 cm long; stipels subulate, puberulent, ciliate, 2–5.5 mm long; petiolules stouter, densely stiff pilose, to 3 mm long; leaflets variable, often nearly orbicular at the base of the plant and lanceolate at the apex, mostly elliptic, acute at the apex and rounded at the base, lustrous, darker, and with pilosity along midrib and some uncinulate puberulence on adaxial surface, densely pilose on the paler abaxial surface, terminal leaflets 4–9 cm long, 2.5–4.5 cm wide, the lateral leaflets 3.3–6 cm long, 1.8–2.7 cm wide. *Inflorescence* terminal and axillary, racemose; rachis angulate, ridged and grooved, densely uncinulate puberulent; pedicels usually solitary, each subtended by 1 primary bract and 2 lateral secondary bracts, all persistent; primary bracts lance acuminate, puberulent on the abaxial surface, ciliate, 2.2–4.5 mm long, 0.5–0.7 mm wide, secondary bracts similar, 1–1.8 mm long, 0.2–0.5 mm wide; pedicels also uncinulate puberulent, 5–10 mm long. *Flowers* with the calyx bilabiate, uncinulate puberulent and pilose, the central tooth of lower lobe 2.5–3.5 mm long, the lateral teeth 2–3.5 mm long, the upper bifid lobe 2.5–3.5 mm long; corolla exceeding the calyx, standard obovate, retuse, unguiculate, 3.5–5 mm long, 4–5 mm wide, the wings oblong, slightly auriculate, unguiculate up to ca. ⅓ their length, 3.5–6 mm long, 1.5–2 mm wide, the keel petals scythe shaped, obtuse at apex, scarcely auriculate, unguiculate, 3.5–6 mm long, 1.5–2 mm wide. *Loment* stipitate, to 8-articulate; stipe 1.5–2 mm long; articles essentially straight above, invaginated about ⅔ their width at the isthmi, uncinulate pubescent throughout, 3.5–4 mm long, 2.5–3 mm wide; seed obtusely oblong, 1 mm long, 0.5 mm wide.

This species occurs in tropical areas throughout the Americas. It is presumably introduced and widespread in the tropics of the Old World.

Desmodium incanum is a widespread more or less shrubby species varying chiefly in the shape of its leaflets. It may be distinguished by its long persistent stipules usually fused and nearly surrounding the stem at least when young, and by its pedicels which are usually borne singly and are each subtended by one

primary bract and two (lateral) secondary bracts. The extent of the range of *Desmodium incanum* is partially indicated by the extent of its synonymy, a new name and description apparently having been provided as it was discovered and collected in each successive new locality.

The vernacular names of *Desmodium incanum* are numerous, some having come with the workmen from the islands of the Antilles. Among the names recorded by collectors in Central America and the West Indies are the following: Pega-pega which is also used for other species of the genus; John Charles; wild pea-nut; strong back; strongbark; and cepa de caballo. The plants are commonly used medicinally, as a tea, and in decoctions as a remedy for inflammation of the stomach and for kidney ailments.

BOCAS DEL TORO: Talamanca Valley, *Carleton 120* (NY, US). Region of Almirante, *Cooper 191* (US). Hill above RR station at milla 7.5, *Croat 16389* (MO). Lincoln Creek, Changuinola Valley, *Dunlap 483* (US). Bar mouth, Changuinola Valley, *Dunlap 517* (GH, MO). Runway at Bocas, *Lazor et al. 2398* (FSU, MO, SCZ). Water Valley, Chiriqui Lagoon, *Wedel 1493, 1851* (both GH, MO, US). Old Bank Island, *Wedel 2060* (MO). Shepherd Island, *Wedel 2675, 2710* (both GH, MO, NY, US). CANAL ZONE: Colón, *Angermuller* (FSU). Barro Colorado Island, *Bailey & Bailey 136* (GH); *Bangham 565* (A); *Croat 4056, 4174* (both MO, SCZ), *5328, 6140* (both MO), *6421* (A), *6684, 6730* (both MO). *6795, 6928* (both A, MO), *7059, 7456* (both MO), *8261, 8675* (both A, MO), *9198* (MO); *9402* (MO, SCZ), *9203* (MO), *11719* (MO, SCZ), *11976* (MO); *Ebinger 30* (GH, MO), *154* (MO), *Foster 1376* (DUKE); *Luteyn 768* (DUKE). Gatun Lake, *Netting 36, 46* (both MO); *Starry 23, 113, 219* (all MO); *Shattuck 43* (GH, MO), *484* (MO); *Standley 40859* (US). Shore near lab, *Woodworth & Vestal 735* (GH). Ft. Kobbe, *Bottimer 1445* (A, DAO). Summit, *Bottimer 1506* (DAO). Monkey Hill, *Cowell 40* (NY). Trail between Río Indio Hydrographic Station and Natural Bridge of Río Puente, *Dodge & Allen 17488* (GH, MO). Just E of Gatun Locks, *Duke 4300* (MO). Chagres, *Fendler 78* (K, MO, P, US). Gamboa, *Greenman & Greenman 5161* (MO). Gatún, *Hayes 79, 81* (both NY). Las Sabanas, *Heriberto 195* (US). Corozal, *Heriberto 274* (US). Las Cruces Trail, 75 m, *Hunter & Allen 756* (MO). Río Chagres Bridge, ca. 2 km by road SE of Gamboa, *Lasseigne 4265* (MO). 2 mi W of Ferry Thatcher Bridge, *Lazor 2199* (FSU). Frijoles, 10–30 m, *Maxon 4708* (US). Near Ft. Randolph, *Maxon 6513* (US). Road C29, 6 km E of Gamboa, 190 m, *Nee 9003* (MO). Panamerican Highway between Rodman Marine Base and Chorrera, *Dwyer 3584* (GH, MO). Gatún, *Ostenfeld 68* (C). Sabanas NE of Panama City, *Paul 150* (US). Corozal, *Piper 5185* (US). Frijoles, *Piper 5191* (US). Ft. Sherman, *Piper 5885* (US). Old Fort Lorenzo, mouth of Río Chagres, *Piper 5926* (US). Río Grande near Culebra, 50–100 m, *Pittier 2093* (BM, C, NY, US). Around Culebra, 50–150 m, *Pittier 3433* (US). Trail between Gamboa and Cruces, 50–80 m, *Pittier 3770* (US). Gamboa, 40–80 m, *Pittier 4438* (US). Ancón Hill, 20–75 m, *Seibert 383* (A, K, MO, NY). Las Cascadas Plantation near Summit, *Standley 25705* (US). Cerro Gordo near Culebra, *Standley 25973* (US). Hills W of the Canal near Gatún, *Standley 27295* (US). Mt. Hope Cemetery, *Standley 28797* (C, US). Río Pedro Miguel near East Paraiso, *Standley 30029* (US). Fort Clayton, Cardenas Creek area, *Tyson 1288* (MO). Fort Sherman near mouth of Chagres River, *Tyson 1534* (SCZ). Old Fort San Lorenzo, *Tyson 1559* (MO). Howard Air Force Base near Red Devil Drop Zone, *Tyson 1879* (FSU, SCZ). Fort Sherman main post, *Tyson 2243* (FSU, MO, SCZ). CHIRIQUÍ: David/Concepion, 60 m, *Burt & Koster 134* (MO). Near Frontera, 100–200 m *Burt & Koster 145* (MO). Monte Verde, 2.5 km W Puerto Armuelles, 80 m, *Busey 415* (MO). Rabo de Puerco 8 km W from Puerto Armuelles, 150 m, *Busey 443* (MO). Boquete, 3800 ft, *Davidson 596* (GH, MO). Road to Gualaca 0–100 m, *Koster 123* (A). Between David and Concepción, *Koster 134* (A). 2 km S of Gualaca, *McCorkle C-35* (FSU, SCZ). 4 km N of Burica, *McCorkle C-140* (FSU, SCZ). COCLÉ: El Valle, *Bottimer 1474* (A, DAO). Weedy field near Santa Clara Beach, *Croat 9603* (MO). Savanna 4–7 mi E of Natá, 10–25 m, *Duke 12397* (NY, OS). Penonomé, *Ebinger 1001* (MO). Road to El Valle, *Ebinger 1101* (MO); *Harkins 1191* (A). Olá, 100–350 m, *Pittier 5048* (US). Between Penonomé and Coclé, *Stern et al. 988* (MO, UC). Penonomé 50–1000 ft, *Williams 116* (NY, US). COLÓN: Río Piedras along road to Portobelo, *Blum et al. 2540* (FSU, GH, MO, SCZ). 2 mi E of Río Piedras, *Correa & Haines 239* (MO, SCZ). ¼ mi N of María Chiquita on road to Portobelo, *Croat 11348* (MO, SCZ). Ridge behind Garotte, *D'Arcy 9339* (MO). Road to Portobelo between Río Piedras and Portobelo, *Elias & Kirkbride 1644* (MO, UC). Colon Highway Bridge on Chagres River, *Lazor & Tyson 3029, 3063* (DUKE, FSU). Mouth of Río Piedras, *Lewis et al. 3174a* (MO). Santa Rita Ridge, 2 mi E of Transisthmian Highway, *Lewis et al. 5244* (MO, SCZ). Portobelo 0–20 m, *Pittier 2458* (NY, US). Palenque near sea level, *Pittier 4130* (US); *Rose 22074* (S, US). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11179* (DUKE). 5 mi NE of Sabanita towards Portobelo, *Wilbur*

& Luteyn 11621 (DUKE). DARIÉN: Santa Fé, *Duke 9493* (MO). Río Piñas, *Duke 10571* (MO). Hydro Camp Pico Pendejo in Monsoon Forest on Río Sabana 50 ft, *Duke 15453* (OS). El Real, *Folsom 4598* (MO). Village of Mannené, *Kirkbride, Jr. & Bristan 1603* (MO). El Real, *Lazor & Correa 3372* (MO), *3387* (FSU, MO); *Lazor & Tyson 3423* (FSU). PANAMÁ: Road to Arenosa from Espina, 16 km N of the Panamerican Highway, *Folsom 3447* (MO). Panama City, Parque Lefevre, *Harkins 1186* (A). San José Island, *Johnston 1006, 1086* (both GH), *Erlanson 131* (GH), *592* (NA). Bella Vista, *Killip 3117* (US); *Koster 145* (A). Chimán, *Lewis et al. 3363* (GH, MO, UC). Near Tapía River, Juan Díaz region, *Maxon & Harvey 6624* (US). Taboga Island, *Miller 1851* (US). Panamerican Highway 2 km W of El Llano, 0–100 m, *Nee 7959* (MO); *Peralta 23* (GH, MO). Taboga Island 0–250 m, *Pittier 3621* (US). Chepo, 60 m, *Pittier 4761* (NY, US). El Valle, 580 m, *Rattray 26* (A). Panamá, *Seemann* (BM), *Seemann* 227 (K). Bella Vista, *Standley 25352* (MO, US). Taboga Island *Standley 27087* (S, US), *27902* (C, US). Río Tapia, *Standley 28184* (US). Garrapata, camino a Platanares, *Taylor 16* (MO). HERRERA: Chitre/Divisa, roadside, 0–100 m, *Burt & Rattray 69* (MO); Vicinity of Ocú, ½ mi NE open pasture, *Stern et al. 1703* (MO). LOS SANTOS: 17.8 mi S of Macaracas, 1100 ft, *Lewis et al. 1612* (GH, MO). Vicinity of headwaters of Río Pedregal, 25 mi SW of Tonosí, 2,500–3,000 ft, *Lewis et al. 2932* (GH, MO), *2948* (MO, UC). Camino del Canal Los Asientos, Sur, *Corina Wendehake 22* (DUKE, MO). SAN BLAS: Puerto Obaldía, *Croat 16973* (MO). Mainland in front of Ustupo, *D'Arcy 9520* (MO). Mulatuppu (Río Ibedî), *Duke 8482,* without other locality *8536* (both MO), *Duke 14831* (NY, OS). Between Río Diablo and Río Acuatí near Narganá, *Duke 14860* (OS). Hydro Camp Cuadí on Río Cuadí, ca. 46 ft, *Duke 15467* (OS). San Blas-Darien Border, Camp Summit, 1200 ft, *Duke 15493* (OS). Soskatupu, *Elias 1672* (MO, UC). Headwaters of Río Mulatuppu, *Elias 1745* (MO, UC). Mouth of Ailigandi River to 2.5 mi inland, *Lewis et al. 166* (MO). Molia, *Stier 60* (MO). VERAGUAS: Savanna 10 mi W of Santiago, *Duke 13649* (OS). 5 mi N of Santiago, Santa María River, *Blum & Tyson 597* (MO, SCZ). PROVINCE UNKNOWN: *Halsted* (NY); *Hayes 51* (NY); *Cuming 1139* (K); *Duchassaing* [anno 1851] (P); *Sinclair* (K, MO).

11. **Desmodium infractum** DC., Prodr. 2: 330. 1825. Based on *Hedysarum biarticulatum* DC.—FIG. 21E–F.

Hedysarum biarticulatum Moc. & Ses. ex DC., Prodr. 2: 330. 1825. as synon., non L. Based on Fl. Mex. Icon. (ined.) *pl. 270* (G, not seen); volume known as "Calques des Dessins de la Flore du Mexique" (i.e. tracings of the original drawings, at GH).
H. infractum Sprengel, Syst. Veg. 4(2): 290. 1827. Based on *D. infractum* DC.
Desmodium barclayi Bentham, Bot. Voy. Sulphur 83. 1844. TYPE: Central America, *Barclay* (K, holotype; GH, NY, photos).
Meibomia barclayi (Benth.) Rose & Standl., Contr. U.S. Natl. Herb. 16: 216. *tab. 51, fig. e.* 1913.
M. infracta (DC.) Blake, Bot. Gaz. 78: 280. 1924.
Nephromeria barclayi (Benth.) Schindl., Repert. Spec. Nov. Regni Veg. 20: 282. 1924.
Nephromeria infracta (DC.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 285. 1926.

Sprawling, subscandent *vine*; stem angulate, ridged and grooved, uncinulate pubescent with somewhat spreading stout, hooked, yellowish trichomes mostly on the ridges and with some puberulence of short, straight, pointed, white trichomes intermixed. *Leaves* trifoliolate, stipulate; stipules early deciduous, obliquely ovate, long acuminate, striate, ciliate, and somewhat soft pilose over abaxial surface, 5–7.5 mm long, 3–5 mm wide at base; petioles adaxially sulcate, ridged and grooved, sparsely to densely uncinulate puberulent to pubescent, 3–7 cm long, the leaf rachis similar to petiole, 1.5–2.5 cm long; stipels linear attenuate to narrowly deltoid attenuate, striate and ciliate, persistent, 2–3.5 mm long; petiolules greenish to dark brown, rugose, patent pilose with slender tapering trichomes, 2–3 mm long; leaflets ovate, obtuse to acute at apex, the terminal cuneate, the lateral leaflets rounded at base, the margins ciliate, adaxial surface bright to dark green, sometimes brownish in age, uncinulate puberulent along the midrib and the chief lateral veins or this puberulence somewhat scattered, sparsely to abundantly spreading pilose with straight tapering trichomes between them, or the 2 types intermixed, abaxial surface always paler, abundantly soft pilose with slender tapering trichomes, the midrib and the lateral veins prominent, the

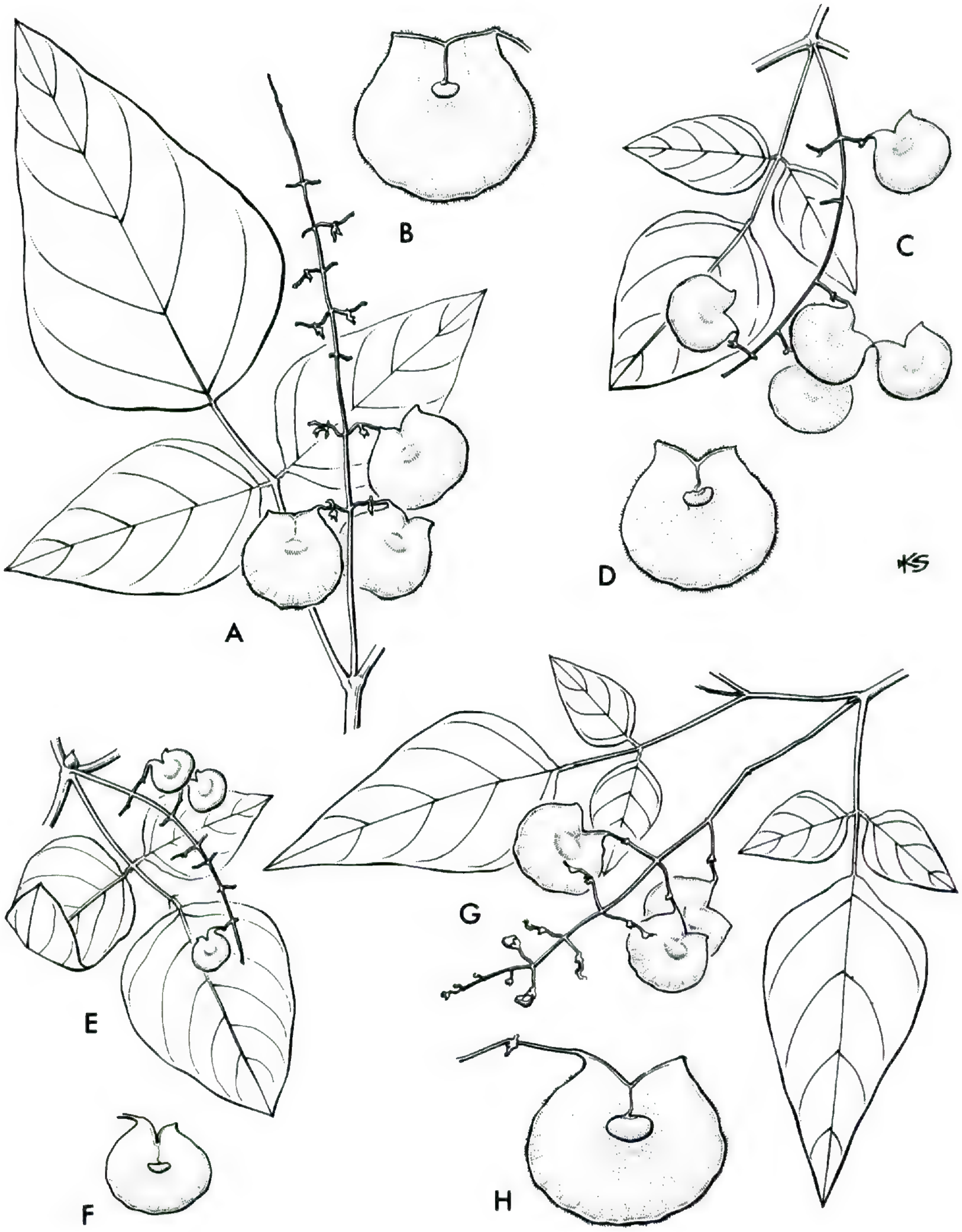

FIGURE 21. *Desmodium*.—A–B. *D. macrodesmum* (Blake) Standl. & Steyerm.—A. Habit (×½).—B. Article of loment split to show elongate funicle and seed inside (×1). [After *Wedel 1773*.]—C–D. *D. rhynchodesmum* (Blake) Standl.—C. Habit (×½).—D. Opened article showing funicle and seed (×1). [After *D'Arcy 11241* (A).]—E–F. *D. infractum* DC.—E. Habit (×½). [After *Tyson 6019* (GH).]—F. Opened article showing funicle and seed (×1). [After *Tyson 6019* (GH).]—G–H. *D. saccatum* Schubert.—G. Habit (×½). [After *Dwyer & Correa 7996*.]—H. Opened article (×1). [After *Dwyer 5028* (GH).]

terminal leaflet 6–7 cm long, 4.5–5.6 cm wide, the laterals 5–5.5 cm long, 3–3.5 cm wide. *Inflorescence* composed of axillary and terminal racemes or highly branched panicles; rachises angulate, striate, densely uncinulate pubescent with stout, yellowish, hooked trichomes underlain by minute, white trichomes; pedicels borne in pairs, each pair subtended by a primary bract; secondary bracts each subtending a single pedicel only rarely seen; primary bracts ovate acuminate, striate, ciliate, puberulent on abaxial surface, early deciduous, 5–7 mm long, 2.5 mm wide[40]; pedicels uncinulate puberulent, 4–7 mm long. *Flowers* with the calyx appressed pilose on the teeth of both lobes, quickly reflexing almost completely at flower maturity, then disintegrating, central tooth of lower lobe 5 mm long, lateral teeth 3.4 mm long, upper bifid lobe 3 mm long[41]; corolla[42] magenta to white, the standard orbicular, scarcely clawed, 4.5 mm long and broad, the wings almost rectangular, short clawed and slightly auriculate, truncate at apex, 5.5 mm long, 4 mm wide, keel petals partially fused, each scythe shaped and tapering to a slender base, 5 mm long, 1.5 mm wide at apex. *Loment* stipitate, (1–)2–3-articulate, the stipe slightly pubescent, becoming glabrate, 3–4 mm long; articles nearly orbicular, with a narrowly V-shaped notch ca. 2.5 mm deep on the dorsal suture, shoulders becoming somewhat beaked, the articles often overlapping, ciliate with both hooked and tapering trichomes, puberulent to glabrous on surfaces; seed reniform, reddish to brown, almost centrally placed in the article but not filling it, long funiculate, ca. 3.5 mm long, 2.5 mm wide.

In the sect. *Nephromeria,* of which it is a member, *Desmodium infractum* is most closely related to *D. painteri* (Rose & Standley) Standley, a species known only from the states of Mexico and Guerrero in Mexico. *Desmodium infractum* differs from *D. painteri* in its larger, more nearly orbicular articles with a narrower, deeper notch on the upper suture that usually flattens out into shoulders (at least on one side). It also differs in its ovate leaflets, rough above to the touch and with only moderately prominent venation below, whereas *D. painteri* has nearly orbicular leaflets with secondary venation prominent on the velvety abaxial surface. In *D. infractum* the pedicel and the stipe of the loment are essentially equal, in *D. painteri* the stipe is shorter (only ⅓–½ as long) than the pedicel.

Desmodium infractum is known from scattered localities in southern Mexico (Oaxaca, Nayarit, Michoacan or Guerrero, Chiapas, and Veracruz) and Central America where specimens have been seen from every country; in Panama it is known from Veraguas, Los Santos, and the Canal Zone; in South America it has been recorded from Colombia, Venezuela, and Ecuador (see Blake, 1924). Much material that was named *D. infractum* from the province of Bocas del Toro, Panama, is actually *D. macrodesmum*.

CANAL ZONE: Vicinity of Madden Dam, alt. 50 ft, *Lewis et al. 7* (GH, MO). Madden Dam area, *Dwyer 11969* (MO). LOS SANTOS: 10 mi N Tonosi, *Tyson et al. 2944* (MO, SCZ). 12 mi S Macaracas, *Tyson et al. 3063* (SCZ). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 6019* (FSU, GH, SCZ).

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[40] Measurements taken from Guatemalan material, *Standley 77910* (GH).

[41] Measurements taken from Guatemalan material, *Standley 74508* (GH).

[42] Measurements of corolla parts taken from Mexican material, *Martinez-Calderon 726* (A). Little flowering material of this species has been collected.

12. **Desmodium intortum** (Mill.) Urb., Symb. Ant. 8: 292. 1 Feb. 1920; non Fawc. & Rendle, Fl. Jam. 4: 34. 25 Mar. 1920.

Hedysarum intortum Mill., Gard. Dict., ed. 8. *Hedysarum* no. 11. 1768. TYPE: Cultivated, England, seed sent from Jamaica by Houstoun.
H. trigonum Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1267. 1806. Based on *Hedysarum intortum* Mill.
Desmodium trigonum (Swartz) DC., Prodr. 2: 332. 1825.
Meibomia intorta (Mill.) Blake, Bot. Gaz. 78: 286. 1924.
Meibomia trigona Gándara, Mem. y Rev. Soc. Cient. "Antonio Alzate" 51: 113. *pl. 14*. 1931. [Described as a new species from Salvador[?], not based on *Hedysarum trigonum* Sw., but belonging here nevertheless.]

Herbs, trailing to climbing; stem triquetrous and grooved, pilose and/or uncinulate pubescent. *Leaves* trifoliolate, stipulate, and petiolate; stipules ovate acuminate, striate, puberulent and somewhat to densely pilose, abundantly ciliate, 5.5–6.5 mm long, 2.5–5 mm wide; stipels linear to narrowly ovate attenuate, puberulent and ciliate, 3–4 mm long; petioles sulcate, finely ridged and grooved, long soft spreading pilose, 3.2–5 cm long; leaf rachis similar, slender, 0.5–1.2 cm long; petiolules stouter, more densely spreading pilose, 1.5–3 mm long; leaflets mostly ovate acute, moderately appressed pilose on both the surfaces, the terminal leaflet rhombic, acute at the apex and rounded to cuneate at base, 3.5–7 cm long, 2.4–4 cm wide, the lateral leaflets nearly elliptic, acute at the apex, rounded at the base, 3–5 cm long, 1.6–2.4 cm wide. *Inflorescence* chiefly terminal, racemose to racemose paniculate; rachis ridged and grooved, densely uncinulate puberulent; bracts ovate acuminate, finely striate, puberulent on abaxial surface, ciliate, 5.5–8.5 mm long, 3–4 mm wide; secondary bracts not seen; pedicels uncinulate puberulent, 4–6 mm long. *Flowers* with the calyx puberulent throughout with some long pilosity on the ciliate teeth of both lobes, the central tooth of lower lobe 4–5.5 mm long, the lateral teeth 2.5–4 mm long, the upper bifid lobe 2.5–3.5 mm long; corolla with standard 6–7.5 mm long, 4–4.5 mm wide, the wings 5.5–7.5 mm long, 2–2.5 mm wide above, the keel petals 5.5–8 mm long, 2–2.5 mm wide above. *Loments* stipitate, to 11-articulate; articles uncinulate pubescent throughout, slightly asymmetrical, more deeply indented below, ca. 3.5 mm long, 2.5 mm wide; seed reniform, 2 mm long, 1.3 mm wide.

In the treatment of *Desmodium* for the *Flora Fanerogámica del Valle de México*[43] (Rzedowski & Rzedowski 1979), *D. aparines* DC. (316, 317) is described as having pedicels from 5.5–16 mm long and as being much confused with *D. uncinatum*. Schindler, in 1926 (Repert. Spec. Nov. Regni Veg. 22: 274–276) proposed that the amalgam of collections relegated in the past to *Desmodium uncinatum* were, in fact, representatives of eleven somewhat related species, five of which he described, op. cit. 20: 142–144. 1924; 22: 274–276. 1926. with distinct geographical distribution. The distributions he cited were well defined, but the characteristics of the species were somewhat less so and, in the case of *D. aparines*, at least two elements are involved as is made clear from his manuscript notes and specimens of loments. According to Schindler the related species of the *Desmodium uncinatum* complex to be found in Panama are *D. aparines* and *D. intortum*. It is also possible that *D. sericeum* (Schindl.) Standl., *D. subseri-*

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[43] Rzedowski, J., & G. C. de Rzedowski, *eds*. Flora Fanerogámica del Valle de México. vol. 1: 314–321. 1979.

ceum Malme and *D. hjalmarsonii* (Schindl.) Standl., all recorded from Costa Rica, may be found in Panama, too. Schindler is of the opinion that *D. uncinatum* is strictly South American in distribution, an opinion I question, although it does not seem to be in Panama. Under these circumstances it seems best not to annotate any collections as *D. aparines,* but to relate them to *D. intortum,* as most have been known, for the time being.

Two collections designated below with an asterisk (*), which I did name, some years ago, as *Desmodium intortum* have differences in type of pubescence of stem and pedicels, larger bracts and larger loment articles. They are part of the relationship of *D. intortum* but not typical.

BOCAS DEL TORO: Talamanca Valley, *Carleton 125* (US). CHIRIQUÍ: Concepción, *Bottimer 1523* (A, DAO). Volcán de Chiriquí, below village of Volcán, *Bottimer 1528a* (DAO). Volcán Cerro Punta, 1460 m, *Burt & Koster 153** (MO). Between Hato del Volcán and Concepción, *Correa & Lazor 1437* (MO). Audubon Cabin, *Croat 13793* (MO). Volcán de Chiriquí, 9000 ft, *Davidson 980* (A, MO, US). Valley of the Río Chiriquí Viejo, 5200–5600 ft, *Duke 8999* (MO). 7 mi S of Volcán on road from David, 600–750 m, *Graham 263* (GH). Between Hato de Volcán and Cerro Punta, 1460 m, *Koster 153** (A). Boquete, 990 m, *Maurice 752* (US). Pastures around Boquete, 1000–1300 m, *Pittier 2963* (US). Valley of the upper Río Chiriquí Viejo, *White 31* (MO). DARIÉN: Agua Fria, ca. 8 mi N of Santa Fé, ca. 50 m, *Duke 10116* (MO). Above Paca, *Williams 708* (US).

12a. **Desmodium intortum** var. **apiculatum** Schubert, Field Mus. Publ. Bot. 13(3): 427. 1943. TYPE: Peru, *Mexia 8158* (F).

Described many years ago, it can be distinguished from *D. intortum* var. *intortum* by its broad, apiculate primary bracts. However, in view of confusion surrounding the whole complex of *Desmodium intortum* and its relatives I prefer not to cite material at this time.

13. **Desmodium macrodesmum** (Blake) Standley & Steyermark, Fieldiana Bot. 24(5): 230. 1946.—FIG. 21A–B.

Meibomia macrodesma Blake, Contr. U.S. Natl. Herb. 24: 6. 1922. TYPE: Honduras, trail from Hacienda El Limón to El Paraíso, Dept. Copán, *Blake 7359* (US, holotype; fragm. GH).
Nephromeria macrodesma (Blake) Schindl., Repert. Spec. Nov. Regni Veg. Beih. 49: 370. 1928.

Scandent *herb* to many meters in length, stem terete and ridged and grooved, long uncinulate pubescent and shorter spreading pilose. *Leaves* trifoliolate, stipulate, stipules early deciduous, only the broad scars seen; petioles adaxially sulcate, angulate, uncinulate puberulent, 2–5 cm long; leaf rachis similar 1–2.5 cm long; stipels narrowly elliptic, long acuminate, striate, ciliate, puberulent on abaxial surface 3.5 mm long, 0.5 mm wide, early deciduous, few seen; petiolules stouter than the leaf rachis, densely stiff pilose 1.5–4 mm long; leaflets acute, the lateral leaflets somewhat obliquely so, the adaxial surface somewhat lustrous, moderately pilosulous, abaxial surface finely silky tomentose with reticulation prominent, terminal leaflet 5.5–10.6 cm long, 3–8.3 cm wide, lateral leaflets 3.2–7 cm long, 1.9–4.9 cm wide. *Inflorescence* of axillary and terminal racemes or developing into much branched panicles; rachis angulate, ridged and grooved, moderately to densely uncinulate pubescent; pedicels in pairs, each pair subtended by 1 primary bract, secondary bracts occurring rarely if at all; primary bracts ovate acuminate, striate, puberulent and ciliate, 4.5–6 mm long, 1.5 mm

wide; pedicels uncinulate puberulent and somewhat pilose, 2.5–5(–12) mm long. *Flowers* with the calyx finely puberulent and long stiff pilose, the teeth of both lobes ciliate, also stiffly short pilose at least on the teeth within, the central tooth of the lower lobe 4–5 mm long, the lateral teeth 3.5–4 mm long, the upper lobe semiorbicular, slightly bifid, 3–4 mm long; corolla exceeding the calyx, violet to purple, standard obovate, deeply retuse, remotely clawed at the base, 5.5–6.8 mm long, 4–5 mm wide, the wings trapeziform, obscurely auriculate, unguiculate at the base, 5.5–6.3 mm long, 3–4 mm wide, the keel petals scythe shaped, long unguiculate (ca. ⅔ their length), 5–6.5 mm long, 1.5–2.5 mm wide at apex. *Loment* stipitate, usually 2-articulate, stipe densely white pilose, 4–7 mm long; articles almost orbicular, shallowly notched above, the seed slightly above the center, the body of the article flat and papyraceous, reticulate, somewhat pilose on surfaces and velvety to the touch, long spreading pilose on sutures, 2.4–2.9 cm long, 2–2.5 cm wide, the isthmus connecting the 2 articles narrow; seed dark reddish brown, reniform (somewhat immature), 3 mm long, 1.5–2 mm wide.

This species is known from Panama, British Honduras, Guatemala and Honduras.

BOCAS DEL TORO: *Carleton 36* (GH). Water Valley, *Wedel 660* (GH, MO), *794, 901, 955* (all MO). Chiriqui Lagoon, *Wedel 1036, 1293, 1773, 2759* (all GH, MO, US). COCLÉ: Between Cerro Pilón and El Valle de Antón, 700–900 m, *Duke & Dwyer 13899* (MO). El Valle de Antón at the foot of Cerro Pilón, ca. 2000 ft, *Dwyer & Correa 7996* (MO, UC); *Ebinger 1114* (MO). PANAMÁ: Cerro Azul, 600 m, *Dwyer 1370, 5143* (both MO). Cerro Campana area, ca. 3000 ft, *Dwyer & Kirkbride 7817* (MO).

14. **Desmodium maxonii** (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 11: 161. 1936.

Meibomia maxonii Standley, Contr. U.S. Natl. Herb. 18: 108. 1916. TYPE: Panama, *Maxon 5370* (US, holotype; GH, photo; NY, isotype).
Meibomia costaricensis Schindler, Repert. Spec. Nov. Regni Veg. 20: 140. 1924. [See note in discussion.]
Desmodium costaricense (Schindler) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 534. 1937.

Shrub to 2 m tall; stem terete, striate, finely uncinulate puberulent and when young long white pilose, glabrescent with pilosity only around nodes. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely lanceolate to ovate with long attenuate apex, striate, ciliate, puberulent and pilose on the abaxial surface, long persistent, 4.5–8 mm long, 3–4.5 mm wide; petioles sulcate, densely long pilose, 1–3.5 cm long; leaf rachis similar, 0.5–1 cm long; stipels subulate to linear lanceolate, striate, pilose and ciliate, 3–5.5 mm long; petiolules stouter than the leaf rachis, long spreading pilose, 2–3.8 mm long; leaflets ovate acute, rounded at the base, mucronate, dark green, puberulent and pilose and uncinulate puberulent on the adaxial surface, paler with prominent venation and long pilosity on the abaxial surface, the margins revolute, the terminal leaflet 3–6.5 cm long, 1.5–3.5 cm wide, the lateral leaflets 2.8–5.5 cm long, 1.2–2.5 cm wide. *Inflorescence* of many dense, short, terminal and axillary racemes, the crowded bracts at the apex with their tips prominent before flowering; rachis densely uncinulate puberulent and somewhat pilose; primary bracts each subtending 2 pedicels, ovate long attenuate, striate, ciliate, pilose on the abaxial surface, 6–10 mm long, 2–5 mm wide; sec-

ondary bracts each subtending 1 pedicel laterally, lance attenuate, ciliate, pilose on abaxial surface, 2.2–6 mm long, 0.2–0.6 mm wide; pedicels uncinulate puberulent and somewhat pilose, 6–12 mm long; calyx puberulent throughout, the teeth of both lobes ciliate, the central tooth of the lower lobe densely long pilose, the upper portion of the tube and the other teeth somewhat pilose, the central tooth of lower lobe 5–8 mm long, the lateral teeth 3–5.5 mm long, the upper lobe entire to bifid, 3–5.5 mm long; corolla with standard obovate to flabellate, rounded to retuse at the apex, narrowed to base, 1–1.3 cm long, 0.6–1.1 cm wide, the wings obliquely oblong, truncate at apex, short unguiculate, 7–12.5 mm long, 3.5–5 mm wide, keel petals broadly truncate at the apex, long unguiculate, 9.5–13 mm long, 4–5.2 mm wide above. *Loment* stipitate, 5–6-articulate; stipe 2.2–4 mm long; articles rhomboidal or appearing so because of alternately revolute margins, uncinulate puberulent, isthmi central, 3.5–4.5 mm long, 2.5–3.5 mm wide; seed reniform, ca. 2 mm long, 1 mm wide.

This species occurs in Central America and southern Mexico (Chiapas).

One collection of *Desmodium, Bottimer 1527,* seems to be a slightly aberrant form of *D. maxonii* but, unquestionably, is more closely related to this species than to any other. The pubescence of the leaflets, the shape, pubescence, and persistence of the stipules, and the shape but not the pubescence of the bracts are all as in *D. maxonii.* The elongate petioles and inflorescence rachises, the softer fine pubescence of the bracts and calyces, the straighter dorsal suture of the loments and the slightly eccentric isthmi indicate, perhaps, a lesser relationship also with some other species, or may be the result of some sort of ecological disturbance.

Included in the manuscript material of the late Dr. A. K. Schindler, purchased by the Arnold Arboretum before his death, are his notes, description, and citations of specimens of *Meibomia costaricensis.* Wherever possible he added annotations to the original studies to bring the information up-to-date before sending it on. For this species he indicated that the specimens *Tonduz 11769* (in part), *Nelson 3599,* and *Killip 3606* are, indeed, *Desmodium maxonii.* See my earlier comments (Schubert, 1941).

CHIRIQUÍ: 3.4 mi NE of Volcán, *Bottimer 1527* (A, DAO). Valley of the Río Chiriquí Viejo N Volcán City, *Duke 9058* (MO). Near El Potrero camp, Chiriquí Volcano, 1900 m, *Killip 3606* (US). Cuesta de Cerro Quemado, E slope of Chiriquí Volcano, 1800–2600 m, *Maxon 5370* (NY, US); *Pittier 3112* (US).

15. **Desmodium molliculum** (H.B.K.) DC., Prodr. 2: 331. 1825.

Hedysarum molliculum H.B.K., Nov. Gen. Sp. Pl. 6: 405 (folio ed.); 6: 519 (quarto ed.). 1824. TYPE: Exact locality unknown (P; GH, photo).

Heteroloma lanatum Desv. ex H.B.K., Nov. Gen. Sp. Pl. 6: 405 (folio ed.); 6: 519 (quarto ed.). 1824, nomen nudum in syn.

Desmodium mexicanum S. Watson, Proc. Amer. Acad. Arts 23 (II. 15): 271. 1888. TYPE: Mexico. Chihuahua, pine plains at the base of the Sierra Madre, *C. G. Pringle 1226* (GH, holotype).

Meibomia mollicula (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Herb, stem repent to scandent from a perennial rootstock, stems densely patent pilose with long white trichomes; leaves trifoliolate, stipulate, petiolate; stipules obliquely ovate, acuminate, striate, ciliate, puberulent and pilose on the

abaxial surface, becoming reflexed at maturity, long persistent, 4–5 mm long, 2 mm wide; petioles sulcate, patent pilose, ca. 1 cm long, the leaf rachis similar, ca. 2–5 mm long; stipels lance attenuate, ciliate, persistent, ca. 2 mm long; petiolules stouter than the leaf rachis, densely pilose 1–1.5 mm long; leaflets appressed pilose on both the surfaces, the terminal leaflet suborbicular, slightly retuse or mucronulate at the apex, rounded to cuneate at the base, to 1.5 cm long and wide, lateral leaflets slightly oblique, cuneate at the base, ca. 1 cm long and wide. *Inflorescence* generally erect, racemose, rachis ridged and grooved, densely uncinulate puberulent to pubescent and with some pilosity; pedicels borne in pairs (or 3's), each pair subtended by a primary bract and each pedicel further subtended by a smaller secondary bract, all early deciduous; primary bracts ovate acuminate, striate, ciliate, and somewhat pilose, 3–5.5 mm long and 1.5–2.5 mm wide; secondary bracts linear, ciliate, puberulent on abaxial surface, ca. 1 mm long and 0.2–0.5 mm wide; pedicels ascending, densely uncinulate puberulent, to ca. 1 cm long. *Flowers* with the calyx bilabiate, puberulent throughout, the central tooth of the lower lobe long acuminate and long pilose, 2.5–4 mm long, lateral teeth acute, only slightly pilose, 2–3 mm long, the upper slightly bifid lobe 2–3 mm long; standard obovate retuse, cuneate at the base, 5.5–6 mm long, 3–4 mm wide, the wings oblong, obtuse and truncate at the apex, unguiculate, 5–6 mm long, 1.5 mm wide, the keel petals scythe shaped, obtuse and truncate at the apex, long unguiculate, 6.5 mm long, 1.5 mm wide. *Loment* stipitate, to 5-articulate, the articles curved above and below, the isthmi slightly eccentric, uncinulate pubescent throughout, to 5 mm long and 3.5 mm wide. Seed suborbicular to quadrate, 2 mm long, 1.5 mm wide.

Desmodium molliculum is known from Panama from 2 incomplete specimens with smaller leaflets than usual. It occurs from Mexico to South America at rather high altitudes.

The persistent, soon reflexed stipules, early deciduous bracts, and ascending pedicels in a rather loose raceme serve to distinguish *D. molliculum* from other species with similar habit and distribution. The seed measurements noted above were taken from *Koch 77382* (A), Mexico.

CHIRIQUÍ: Llanos del Volcán, 1120–1200 m, *Seibert 345* (MO). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5833* (SCZ).

16. **Desmodium perrottetii** DC., Mém. Légum. 7: 324. 1825. TYPE: Guiane Française. *Perrottet* 1820 (G, holotype; GH, photo).

Meibomia distorta (Aubl.) Schindler var. *perrottetii* (DC.) Schindl., Repert. Spec. Nov. Regni Veg. 22: 282. 1926.

Herb; stem apparently simple, terete to subangulate, finely striate, uncinulate puberulent. *Leaves* unifoliolate; stipules transversely oblique, ovate attenuate, striate, densely long pilose on the abaxial surface, finely long pilose on the adaxial surface, ciliate, persistent, 8.5 mm long, 4 mm wide; stipels ovate attenuate, striate, pilose and puberulent, ciliate, persistent, 6 mm long, ca. 1 mm wide; petiolate, petiole densely uncinulate puberulent, sulcate, striate, 1 cm long; petiolule densely stiff spreading pilose, 3 mm long; single leaflet narrowly ovate elliptic

to ovate, obtuse at the apex and the base, broadest slightly below the middle, uncinulate puberulent and somewhat appressed pilose on the adaxial surface, tomentose with dense, long, appressed pilosity, and with prominent venation on abaxial surface, 6.5–8.5 cm long, 4.5–5 cm wide. *Inflorescence* much branched, racemose paniculate, rachises angulate, striate, uncinulate puberulent and with long spreading gland based trichomes; primary bracts ovate attenuate, striate, pilose, ciliate, early deciduous, ca. 3 mm long, 1 mm wide; secondary bracts 1 mm long, slender (only few seen); pedicels borne in pairs, ascending, with pubescence similar to that of inflorescence rachis, 2.5–3 mm long. *Flowers* with the calyx bilabiate, the teeth of both lobes all ciliate, the surface puberulent and somewhat pilose throughout, the upper bifid lobe obtuse, 2 mm long, the central tooth of the lower lobe acuminate, 2.5 mm long, the lateral teeth acute, 2 mm long; corolla with standard obovate, slightly retuse at the apex, gradually narrowed to the base (which is ca. 2 mm wide), 3.5 mm long, 2.5 mm wide, the wings obliquely oblong, obtuse at the apex, scarcely unguiculate (short clawed), 3.5 mm long, 1.5 mm wide, the keel petals scythe shaped, truncate at the apex, unguiculate (long clawed), 3.5 mm long, 1 mm wide. *Loment* stipitate, to 5-articulate; stipe 2 mm long; articles orbicular, the subterminal ones twisted or with the margins revolute, pubescent with fine glandular trichomes and long stiff spreading pilosity, 2 mm long, 1.5 mm wide; seeds brown, almost quadrate, 0.7 mm long, 0.5 mm wide.

Desmodium perrottetii is known from British Guiana, French Guiana and Peru.

It was treated as a variety of *Meibomia distorta* by Schindler which may be a more reasonable disposition. However, it would be best to see more material before making a final decision.

COCLÉ: Between Paso del Arado and Olá, 20–280 m, *Pittier 5022* (US).

17. **Desmodium procumbens** (Mill.) Hitchc., Ann. Rep. Missouri Bot. Gard. 4: 76. 1893.

Herb with several to many stems arising from the base and soon becoming procumbent. *Leaves* trifoliolate or occasionally unifoliolate, stipulate, petiolate; leaflets narrowly to broadly ovate. *Inflorescence* axillary and terminal, racemose to racemose paniculate and highly diffuse; primary bracts subtending fascicles of 3 to several pedicels, of which 2 mature together first; secondary bracts similar to the primary but smaller. *Flowers* with the calyx puberulent and scattered short pilose throughout. *Loments* sessile to short stipitate, to 5-articulate; articles with isthmi central, rhombic in outline appearing slightly to much twisted.

17a. **Desmodium procumbens** var. **longipes** (Schindler) Schubert, Contr. Gray Herb. 129: 8. 1940.

Hedysarum tenellum H.B.K., Nov. Gen. Sp. Pl. 6: 408 (folio ed.); 522 (quarto ed.). 1824, non D. Don, Prodr. Fl. Nepal. 243. 1825, nec Sprengel ex DC., Prodr. 2: 333. 1825, in syn. TYPE: *Humboldt & Bonpland,* Caracas, 440 hex. (P, holotype; GH, photo).
Desmodium tenellum (H.B.K.) DC., Prodr. 2: 333. 1825.
Cyclomorium caracasanum Walp., Repert. 2: 890. 1843. TYPE: Caracas *Moritz 25* (B?, not seen).

Meibomia tenella var. *longipes* Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924. TYPE: *Bernoulli & Cario 1206*, Guatemala. Retalhuleu.

The variety *longipes* differs from var. *procumbens* in its more diffuse and delicate aspect, almost completely glabrous stems, thinner leaflets somewhat broader in proportion to their length and more abundantly pilose on both surfaces, and most conspicuously by its slender and elongate, only slightly puberulent pedicels, 12–27 mm long, and its smaller loment articles, 1.5 mm long and 1.3–1.5 mm wide, which seem tightly twisted and have essentially glabrous sutures.

This species occurs in southern Mexico, Central America, and northern South America.

Variety *longipes* occasionally has its upper leaves unifoliolate and, in some areas (near Zamorano, Honduras), it often bears quinquefoliolate leaves.

For an earlier treatment of this variety and a discussion of the synonymy involved see Schubert 1940.

CANAL ZONE: Quebrada Fea, Quebrada Pura and Cañon of Río Chagres, 70–100 m, *Dodge & Allen 17410* (G, GH, MO). Río Grande near Culebra, 50–100 m, *Pittier 2126* (NY, US). Las Cascadas Plantation near Summit, *Standley 29685* (US). CHIRIQUÍ: Cerro de la Plata near San Félix, 120–150 m, *Pittier 5154* (US). COCLÉ: Olá, 100–350 m, *Pittier 5080* (US). PANAMÁ: Río Tocumen, *Standley 29427* (US).

17b. **Desmodium procumbens** var. **procumbens.**

Hedysarum procumbens Mill., Gard. Dict., ed. 8. *Hedysarum* no. 10. 1768. TYPE: Jamaica. *Houstoun*, 1730 (BM; GH, photo).

H. spirale Swartz, Prodr. 107. 1788. Fl. Ind. Occ. 3: 1273. 1806. Based on the type of *Hedysarum procumbens* Mill., which Swartz cited in synonymy.

Desmodium spirale (Swartz) DC., Prodr. 2: 332. 1825.

D. tenuiculum DC., Prodr. 2: 333. 1825. TYPE: *Bertero*, Santo Domingo (G-DC; GH, photo), based on *Hedysarum tenellum* Sprengel, non H.B.K.

Hedysarum tenellum Spreng. ex DC., Prodr. 2: 333. 1825, nomen in syn.

Desmodium sylvaticum Benth., Pl. Hartw. 1: 116. 1843. TYPE: *Hartweg 650* (K, holotype; GH, isotype).

Meibomia spiralis (Swartz) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

M. procumbens (Mill.) Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924.

M. procumbens var. *sylvatica* (Benth.) Schindler, Repert. Spec. Nov. Regni Veg. 20: 151. 1924.

Stem terete, striate, uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules lance attenuate, obliquely auriculate at base, minutely puberulent on abaxial surface, 4–6 mm long, 1–1.5 mm wide; petioles sulcate, uncinulate puberulent, 1–3.3 cm long, leaf rachis similar to petiole, 0.4–0.7 cm long; stipels linear lanceolate, 1.7–2 mm long; leaflets pilose and uncinulate puberulent on both surfaces, the margins stiffly ciliate, the terminal leaflets narrowly to broadly ovate rhombic, obtuse to acute at the apex, mostly cuneate at base, 2.3–6 cm long, 1–3.6 cm wide, the lateral similar, slightly oblique, 1.7–4.5 cm long, 0.8–2 cm wide. *Inflorescence* rachis densely uncinulate puberulent; primary bracts, each subtending 2 to more pedicels, essentially linear to narrowly ovate attenuate, striate, ciliate, puberulent over abaxial surface, 1.5–2.5 mm long, 0.5 mm wide; secondary bracts, each subtending a single pedicel, linear, ciliate, and puberulent, 0.5–0.8 mm long; pedicels stiff, uncinulate puberulent, 5–7 mm long. *Flowers* with the teeth of both calyx lobes ciliate, the central tooth of the lower lobe 1.5–2 mm long, the lateral teeth 1.3–1.5 mm long, the upper bifid lobe 1.3–1.5 mm long; standard obovate to flabellate, slightly retuse at the apex, mostly rounded

above and cuneate at base, 2–3.5 mm long, 1.5–3 mm wide, the wings oblong, obtuse, scarcely auriculate, short unguiculate, 2–2.5 mm long, 1 mm wide, the keel petals remotely scythe shaped, truncate at the apex, narrowed to the unguiculate base, 2.5–3.5 mm long, 0.8–1 mm wide. *Loment* with articles uncinulate puberulent throughout, 3 mm long, 2 mm wide.

This species occurs from northern Mexico southward through Central America, the West Indies, and the northern half of South America, in tropical Africa and the Philippine Islands (where probably introduced).

Variety *procumbens* is the most widespread of the four varieties of *Desmodium procumbens*. Although its leaflets may have prominently reticulate venation and an aspect closely approaching that of *D. tortuosum* to which it is related, *D. procumbens* var. *procumbens* may be distinguished by its smaller, much less conspicuous stipules, its shorter pedicels, usually borne at right angles to the inflorescence rachis at maturity, and its loment articles regularly smaller and more consistently rhombic in outline.

BOCAS DEL TORO: Changuinola, *Godfrey 67321* (FSU). CANAL ZONE: Sabanas N of Panama City, *Paul 585* (US). Experiment Station, *Pittier 6909* (G, K, US). Hospital grounds, Ancón, *Pittier 6909* (P). Balboa, *Standley 25491* (US). Frijoles, *Standley 27651* (US). Gamboa, *Standley 28472* (US). Near Ft. Randolph, *Standley 28757* (US). Darién Station, *Standley 31569* (US). PANAMÁ: 1 mi E of Tocumen Airport on side road off Panamerican Highway, *Blum & Tyson 1958* (FSU, SCZ). San José Island, *Johnston 542* (BM, GH), *1005* (GH). Bella Vista, *Standley 25328* (US). Corozal road near Panamá, *Standley 26771* (S, US). Taboga Island, *Standley 27081* (C, US). Juan Franco Race Track near Panamá, *Standley 27698* (S, US). Taboga Island, *Standley 27948* (US). Tumba Muerto Road, near Panamá, *Standley 29728* (US). Taboga Island near village, *Tyson & Loftin 5144* (FSU, MO, SCZ). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 6015* (FSU, MO, SCZ). PROVINCE UNKNOWN: Camino de Las Sabanas, *Heriberto 264* (US).

18. **Desmodium rhynchodesmum** (Blake) Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 535. 1937 [Fl. Costa Rica].—FIG. 21C–D.

Meibomia rhynchodesma Blake, Bot. Gaz. 78: 278. 1924. TYPE: Costa Rica. Tuis, 650 m, *Tonduz 11448* (US-694364, holotype; isotypes US-943724, fruit, US-943725, flower).

Herbaceous vine to subshrub (?), scandent, festooning on thicket (*D'Arcy 11241*) or climbing on trees (*Shank & Molina 4180*, Costa Rica); stem subterete to subangulate, uncinulate pubescent with upwardly directed, yellowish trichomes and also minutely puberulent; *leaves* trifoliolate, stipulate, stipules early deciduous, only the scars seen; petioles subterete to angulate, ridged and grooved, sulcate on adaxial surface, uncinulate puberulent throughout, 2.3–4 cm long, the leaf rachis similar to the petiole, 1–1.9 cm long; stipels linear attenuate, ciliate, early deciduous, 3 mm long[44]; petiolules stouter than the leaf rachis, rugose, spreading pilose with straight tapering trichomes, those of terminal leaflet 2–3.5 mm long, of lateral leaflets 1.5–2 mm long; terminal leaflets ovate acute, usually cuneate at base, apiculate at apex, the laterals elliptic, slightly oblique, rounded at the base, acute and apiculate at the apex, all minutely uncinulate puberulent on the adaxial surface, rather densely soft white pilose on the abaxial surface, the terminal leaflets 4.2–9 cm long, 3–6.7 cm wide, laterals 2.8–5.7 cm long, 1.6–3.1 cm wide. *Inflorescence* of axillary racemes or these forming a large,

[44] Inflorescence/infructescence of isotypes from Costa Rica included in this description.

lax, spreading panicle[45], rachises angulate, ridged and grooved, minutely puberulent and glandular dotted, and with uncinulate pubescence of pale golden trichomes; pedicels regularly borne in pairs, but each 2 not always maturing together, each pair subtended by an ovate acuminate striate primary bract[44], minutely puberulent over the abaxial surface and somewhat pilose, the margins ciliate, ca. 3.5 mm long and 2 mm wide; secondary bracts[44], each subtending 1 pedicel, rare, linear with a tuft of trichomes at the apex, 0.5–1 mm long, 0.25 mm wide; pedicels minutely puberulent with fine, short, white trichomes and sparsely to abundantly uncinulate puberulent with longer, yellowish (or white) trichomes, 4.5–5 mm long. *Flowers* with the calyx minutely puberulent throughout and with long stiff tapering trichomes along the whole surface of the central tooth of lower lobe, scattered on the other teeth and on the upper lobe, all teeth ciliate, the central tooth of the lower lobe 3.5–4.5 mm long, the lateral teeth 3–3.5 mm long, the upper bifid lobe 3–3.5 mm long; standard[44] obovate, slightly tapered toward the base, 6.5 mm long, 4 mm wide, the wings remotely rectangular in outline, truncate at the apex, slightly auriculate and short unguiculate at the base, 5 mm long, 3 mm wide, the wings scythe shaped, long unguiculate, obtuse at the apex, 5.5 mm long, 1.5 mm wide; vexillar stamen fused ca. ¼ its length, then free from the others. *Loment* stipitate, 1–2-articulate, the stipe pilose with appressed to spreading or downwardly directed tapering trichomes, 3.5–4.5 mm long; articles saccate, notched at the apex, the shoulders beaked at maturity, the margin ciliate throughout, the surface minutely puberulent, 1.7–2.3 cm long and high; seed reniform, to ca. 4 mm long and 2 mm wide, funicle to ca. 3.5 mm long.

Since 1924, when Blake described *Desmodium rhynchodesmum* (as *Meibomia*), the only other material that has been referred to this species is one specimen from Limon Province in Costa Rica, and the two collections from Panama, one from Bocas del Toro and one from Colón. Decisions about the distinctness of *D. rhynchodesmum* must await the collection of more material and better field observations. However, it seems this species can be reasonably well distinguished from its closest relatives, *D. macrodesmum* and *D. saccatum* by the characters cited in the key. Schindler, Repert. Spec. Nov. Regni Veg. 22: 288. 1926, equates *Meibomia rhynchodesma* with *Nephromeria metallica* (Rose & Standley) Schindler, which is, in my opinion, incorrect.

BOCAS DEL TORO: Trail leading to ridge above Almirante, *Gentry 2760* (MO). COLÓN: Río Iguanita, 390 m, *D'Arcy 11241* (A, MO).

19. **Desmodium saccatum** Schubert[46]. TYPE: Panama, *Dwyer 2990* (MO 1800522, holotype).—FIG. 21G–H.

Vines, sometimes high climbing; stem terete, uncinulate puberulent to pubescent, glabrescent, finely striate, to 1 m (or more) in length. *Leaves* trifoliolate,

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[45] Seen only on flowering isotype from Costa Rica (US 943725).

[46] *Desmodium saccatum* Schubert, spec. nov. A speciebus affinibus differt articulis saccatis, incisura in suturo superiori angulo acuto vel obtuso formanti, in maturitate in humeros non applanata.

stipulate, stipules stramineous ovate acute to acuminate, lobed to auriculate at the base, striate and with scattered long pilosity over the abaxial surface, ciliate, early deciduous (2–)3–4 mm long, (1.5–)2–3 mm wide at base; petioles remotely to obviously sulcate adaxially, somewhat angulate, striate, moderately to abundantly uncinulate puberulent, usually glabrescent, 2–5.5 cm long; leaf rachis similar to the petiole, 1–2.5 cm long; stipels linear lanceolate to linear attenuate, green to stramineous, striate, puberulent, and ciliate, somewhat swollen and slightly auriculate at the base, usually early deciduous, 2.5–4 mm long; petiolules dark green, stout, rugose, densely pilose with yellowish red, straight, tapering trichomes and some short, hooked ones intermixed, those of the terminal leaflets 2–4 mm long, of the laterals 1.5–3 mm long; leaflets triangular to subrhombic in outline, the terminal leaflet usually cuneate at the base, acuminate to the apex, the laterals truncate to rounded at the base, acute at the apex, all usually mucronate, moderately uncinulate puberulent and moderately to abundantly appressed pilose with stout trichomes on the adaxial surface, abundantly longer appressed pilose with tapering stout whitish or golden trichomes, the latter especially along the midrib and the margins which are sometimes involute and always somewhat ciliate, the terminal 6–12 cm long, 3–6 cm wide, the laterals 3–6 cm long, 2–3.3 cm wide. *Inflorescence* of long, lax, axillary racemes and panicles of ephemeral flowers; rachises uncinulate puberulent with golden trichomes; pedicels regularly borne in pairs, each pair subtended by an ovate acuminate, striate, ciliate, early deciduous primary bract, 2.5–3 mm long, 1–2 mm wide, secondary bracts rarely seen; pedicels uncinulate puberulent with slender trichomes, 9–12 mm long. *Flowers* with the calyx puberulent throughout, long stiff, appressed pilose with golden trichomes over the teeth of both the lobes, the central tooth of the lower lobe 3–4.5 mm long, the lateral teeth 2.5–4 mm long, the upper bifid lobe 2–4 mm long; corolla white to blue, standard obovate, scarcely clawed, 3.5–6.5 mm long, 3–5 mm wide, wings semi-elliptic, obliquely trapezoid, short auriculate, short clawed, 4–5.5 mm long, 2.5–4 mm wide, the keel petals partially fused, roughly scythe shaped, tapering toward the base, 3.5–9 mm long, 1.5–3 mm wide at the apex; stamens fused from the base for about ½ their length, then vexillar stamen becoming free. *Loment* stipitate, the stipe puberulent, becoming glabrous, 3–5 mm long; articles green, sometimes with a pink tinge, becoming brown at maturity, densely soft pilose throughout but only minutely puberulent to glabrescent over surface when mature, ciliate on sutures, 2–2.9 cm long, 1.7–2.3 cm wide from the base of the notch to the base of the article, the notch ca. 5 mm long; seed subreniform, 2.5–6.5 mm long, 1.4–4 mm wide.

The four species *Desmodium infractum, D. macrodesmum, D. rhynchodesmum,* and *D. saccatum* are related members of a group Schindler treated as *Nephromeria* subgenus *Nephromeria*. He maintained *D. axillare* in *Nephromeria* subgenus *Swartziella*. At present I consider these species as members of *Desmodium* section *Nephromeria* Bentham. They are distinguished from the species Schindler treated as the genus *Meibomia,* which includes most of the remaining species of Panama, by the almost orbicular loment articles, dehiscence of the loment by the upper, seed-bearing suture, a vine-like habit, ephemeral flowers, and long funiculate seeds not filling the articles. *Desmodium axillare* differs substantially from this group of species and will be discussed in detail elsewhere.

The four species noted above differ from each other as indicated in the key. *Desmodium saccatum* is the only member of the group having a straight-sided, broadly V-shaped notch, which does not flatten out into shoulders or become beaked at maturity.

COCLÉ: El Valle de Antón, 860–900 m, *Croat 37386* (MO); *Duke & Dwyer 13899* (SCZ); *Dwyer* (MO); *Ebinger 1114* (MO); *Lewis et al. 2529* (MO); *Spellman et al. 593* (MO). COLÓN: Santa Rita Ridge lumber road, 300–500 m, *Correa & Dressler 909* (DUKE, FSU, MO); *Gentry 6113* (MO); *Wilbur et al. 15029* (DUKE). PANAMÁ: Cerro Campana, 780–875 m, *Croat 25215* (A, MO). La Eneida, region of Cerro Jefe, *Dressler & Williams 3954* (MO). Cerro Azul, 600 m, *Dwyer 1370* (SCZ, US); *Dwyer 2990* (MO). Cerro Campana, *Gentry 5781* (FSU). Near Portobelo, *Gentry 6325* (DUKE, MO). Cerro Campana, *Witherspoon & Witherspoon 8381* (A, MO).

20. **Desmodium scorpiurus** (Swartz) Desv., J. Bot. (Desvaux) 1: 122. 1813; DC., Prodr. 2: 333. 1825, not *D. scorpioides* Micheli, Bull. Soc. Bot. Belg. 30: 289. 1891, error for *D. scorpiurus*.

Hedysarum scorpiurus Swartz, Prodr. 107. 1788; Fl. Ind. Occ. 3: 1269. 1806. TYPE: Jamaica. *Swartz* (S, holotype; GH, photo).
Desmodium virgatum Desv., J. Bot. (Desvaux) 1: 122. 1813, not *Hedysarum virgatum* Thunb.
Desmodium arenarium H.B.K., Nov. Gen. Sp. Pl. 6: 412 (folio ed.): 6: 527 (quarto ed.). 1824; DC., Prodr. 2: 331. 1825. TYPE: Venezuela, Atures, *Humboldt & Bonpland 851* (P, holotype; GH, photo).
Desmodium multicaule DC., Prodr. 2: 331. 1825. TYPE: Peru. *Lagasca 48* (G-DC, holotype; GH, photo).
Desmodium parviflorum Mart. & Gal., Bull. Acad. Bruxelles 10: 185. 1843. TYPE: Mexico, Veracruz. *Galeotti 3337* (P, isotype; F, GH, photos).
Meibomia scorpiurus (Swartz) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Meibomia arenaria (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia multicaulis (DC.) Kuntze, Rev. Gen. Pl. 1: 198. 1891.
Nissoloides cylindrica M. E. Jones, Contr. West. Bot. 18: 135. 1935. TYPE: Mexico, Jalisco, Guadalajara. *Jones 3784* (GH, isotype).

Prostrate or repent to ascending, much branched *herb*; stem angulate, striate, sparsely uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate, acuminate, auriculate at base, auricles of the 2 stipules usually overlapping on the opposite side of the stem from the petiole base, puberulent, long ciliate, usually persistent, 2–3.5 mm long, 1.8–3 mm wide; petioles sulcate, long pilose along the groove, otherwise angulate, striate, and uncinulate puberulent, 0.9–2 cm long, the leaf rachis similar, 0.2–0.5 cm long; stipels lance attenuate, striate, ciliate, 0.8–2 mm long; petiolules of terminal leaflets 1–2 mm long, of lateral leaflets 0.8–1.5 mm long; leaflets somewhat uncinulate puberulent and appressed pilose on the adaxial surface with trichomes ca. 1 mm long, moderately appressed long pilose and remotely uncinulate puberulent on the abaxial surface, the margins ciliate, the terminal leaflet elliptic, obtuse at the base and the apex or cuneate at base, 0.9–2.5 cm long, 0.7–2 cm wide, the lateral leaflets obliquely elliptic, rounded at the base, acute at the apex, 0.8–2.2 cm long, 0.4–1.5 cm wide. *Inflorescence* of axillary and terminal racemes; rachis angulate, striate, uncinulate puberulent, remotely pilose with glandular trichomes; primary bracts narrowly ovate acuminate, striate, puberulent and pilose on the outer surface, puberulent on the inner surface, often reflexed at maturity, 1.5–2.5 mm long, 0.8–1 mm wide, each subtending an indeterminate number of pedicels and each pedicel further subtended by a smaller similar secondary bract borne more or less laterally, 0.8–

1 mm long, 0.3–0.4 mm wide; pedicels somewhat uncinulate puberulent and moderately pilose with glandular trichomes, 4–8 mm long. *Flowers* with the calyx minutely puberulent and stiffly long pilose throughout, teeth of the lower lobe slender, the central tooth 2–3 mm long, the lateral teeth 2–2.5 mm long, the upper lobe 2–2.6 mm long, bifid for 0.5 mm of its length; corolla exceeding the calyx, the standard obovate, deeply retuse, the 2 halves of the apex rounded, narrowed to an obtusish base, 3.5–4.5 mm long, 2.5–4 mm wide, the wings oblong, truncate above, auriculate and short unguiculate, 3.3–4 mm long, 1.5 mm wide, the keel petals scythe shaped, narrowed to a tapering base, 3.5–4.5 mm long, 1–1.5 mm wide. *Loment* short stipitate, the stipe 1 mm long, 7–8-articulate, the articles narrowly elliptic, isthmi almost as wide as the articles, the surfaces strongly and closely reticulate, densely uncinulate pubescent, 4 mm long, 1.5 mm wide; seed rectangular, 2 mm long, 1 mm wide.

Desmodium scorpiurus ranges throughout tropical America, occurring occasionally as a weed in tropical areas of the Pacific, and in Africa.

Its fruit and stipules serve to distinguish *Desmodium scorpiurus* from other American species; it seems to have no close relatives in the New World. *Desmodium scorpiurus* is the conserved type of the conserved name *Desmodium*.

BOCAS DEL TORO: Almirante, *Barrus 403* (GH). Junction of Ríos Changuinola and Terebe, 100–200 ft, *Lewis et al. 962* (MO). CANAL ZONE: Barro Colorado Island, *Bottimer 1486* (A, DAO); *Croat 6923* (MO), *6972* (A, MO), *13799* (MO, SCZ), *15580* (A, MO); *Hladick 88* (MO); *Netting 7* (MO); *Shattuck 120* (MO); *Starry 278* (MO). Corozal to Pedro Miguel, *Cowell 398* (NY). Ancón, *Croat 9236* (MO); *Greenman & Greenman 5001* (DUKE). Empire Station, *Hayes 504* (BM, K). Las Cruces Trail, 75 m, *Hunter & Allen 691* (G, GH, MO). Balboa Heights, *Killip 3396* (US). ½ mi NW of Gamboa, 70 m, *Liesner 1395* (MO). Balboa, *Macbride & Featherstone 45* (US). La Boca, *Mori & Kallunki 3683* (MO). Ancón, *Piper 5183, 5187, 5194* (all US). Río Grande near Culebra, 50–100 m, *Pittier 2107* (US). Ancón, 20–80 m, *Pittier 6909* (NY). Summit near Gatún, *Standley 27317, 30114* (both US). Balboa, *Standley 30838* (US). Darien Station, *Standley 31531, 31566* (both US). CHIRIQUÍ: Gualaca, 0–100 m, *Burt & Koster 122* (MO). Rabo de Puerco 8 km W of Puerto Armuelles, 50–150 m, *Croat 21970* (MO). Ridge above Brazo Seco near Costa Rican border, 100–200 m, *Croat 22565* (MO). Road to Alanje, 0–100 m, *Koster 138* (A). Quebrada Mellize 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 432* (MO). COCLÉ: El Valle, *Bottimer 1476* (A, DAO). Penonomé, 50–1000 ft, *Williams 103* (NY). COLÓN: Without other locality, *Rodway* (K). Colon, *Rose 22064* (US). LOS SANTOS: Near Sabana Grande, 0–100 m, *Burt & Koster 100* (MO). Las Cruces/Macaracas, 100–200 m, *Burt & Koster 101* (MO). Between Las Cruces and Macaracas on way to Tonosí, 100–200 m, *Koster 101* (A). Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2995* (DUKE, MO, UC). PANAMÁ: Near Chepo, 0–100 m, *Burt & Rattray 13* (MO). Near Pacora, 0–100 m, *Burt & Rattray 19* (MO). Between Chepo and El Llano, *Croat 14494* (MO). Savannas near Chepo, *Duke 6051* (MO). Río Pacora just below confluence with Río Corso, *Duke 11997* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5103* (MO). San Jose Island, *Johnston 1000, 1092* (both GH, U). Savanas, *Macbride, 2651* (US). Between Río Pacora and Chepo, *Porter et al. 5135* (MO). Near San Carlos, 0–100 m, *Rattray 36* (A). VERAGUAS: Atalaya/Ponuga, 100–200 m, *Burt & Koster 100A* (MO). Between Atalaya and Ponuga, 100–200 m, *Koster 100A* (A).

21. **Desmodium sericophyllum** Schlecht., Linnaea 12: 317. 1838. TYPE: Mexico, Veracruz, "San Andres et Hac. de la Laguna (*Schiede*)" (not seen).

Meibomia sericophylla (Schlecht.) Kuntze, Rev. Gen. Pl. 1: 197. 1891.

Perennial *herb*, sometimes procumbent to ascending, becoming 1 m or more long; stems angulate, ridged and grooved, densely white tomentose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate attenuate, striate, puberu-

lent and pilose on the abaxial surface, abundantly ciliate, usually becoming reflexed, often early deciduous, 5–7.5 mm long, 2–3.5 mm wide at the base; petioles sulcate, densely tomentose, 1.3–2 cm long; leaf rachis similar to petiole, 0.4–1 cm long; stipels linear attenuate, pilose, and ciliate, to 3.5 mm long; petiolules stout, densely tomentose, 2–4 mm long; leaflets softly appressed pilose and dark on adaxial surface, paler and tomentose on the abaxial surface with some reticulate venation evident, the leaflets ovate to elliptic, acute to obtuse and mucronulate at the apex, rounded to cuneate at the base, the terminal leaflet 3.5–6 cm long, 2–3.5 cm wide, the lateral leaflets 3–5 cm long, 1.5–2.5 cm wide. *Inflorescence* racemose to racemose paniculate; rachis subangulate, finely ridged and grooved, uncinulate puberulent throughout; pedicels borne in pairs, each pair subtended by an ovate acuminate, striate, ciliate primary bract, puberulent and somewhat pilose on the abaxial surface, 8–9.5 mm long, 3–5 mm wide; secondary bracts minute, if present, not persistent; pedicels densely uncinulate puberulent, becoming reflexed soon after anthesis, 2.5–4 mm long. *Flowers* with the calyx minutely puberulent throughout, the teeth of both the lobes somewhat ciliate, especially at the apex, and with at least scattered pilosity along the central tooth of the lower lobe and on the upper lobe; central tooth of the lower lobe 4–5 mm long, the lateral teeth 3–3.5 mm long, the upper bifid lobe 3 mm long; standard obovate, slightly retuse, cuneate at the base, 5.5–9 mm long, 4–6 mm wide, the wings oblong, obtuse at the apex, unguiculate at the base, 5.5–10 mm long, 1.5–3 mm wide, the keel petals scythe shaped, curved and truncate at the apex, long unguiculate, 5.5–10 mm long, 1.5–3 mm wide. *Loment* stipitate; stipe 1–2.5 mm long, to 7-articulate; articles suborbicular to subrhombic in outline, with the upper suture usually slightly curved, the lower almost angulate, surfaces uncinulate puberulent throughout, 3–4 mm long, 3 mm wide, the isthmi at least slightly eccentric, ca. 1.5 mm wide; seed subreniform, 2 mm long, 1.5 mm wide.

This species is known in Panama only from Chiriquí Province. It occurs from Central Mexico southward through Central America, to Venezuela and Colombia. Two collections cited below, *Tyson 5824* (FSU, MO, SCZ) and *5831* (SCZ) are somewhat atypical in leaflet shape, but conform reasonably well in other characters to this species.

It is easy to distinguish *Desmodium sericophyllum* from other species of the genus in Panama by its leaflets which are velvety to the touch on both surfaces, and by its short pedicels which become reflexed at anthesis or soon after, so that, for a time at least, the loments appear to be imbricated.

CHIRIQUÍ: 3.4 mi NE of Volcán, *Bottimer 1528* (A, DAO). El Boquete, 1000–1400 m, *Cornman 2055* (US); *Maurice 715* (US). Between Cerro Vaca and Hato del Loro, eastern Chiriquí, 850–1100 m, *Pittier 5386* (NY, US). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5744* (SCZ); 3 mi N El Volcán on lava flow, 5000 ft, *Tyson 5824* (FSU, MO, SCZ), *5831* (SCZ); *Davidse & D'Arcy 10340* (A).

22. **Desmodium tortuosum** (Swartz) DC., Prodr. 2: 332. 1825.

Hedysarum purpureum Mill., Gard. Dict., ed. 8. *Hedysarum* no. 6. 1768. TYPE: Mexico, Veracruz, *Houstoun* 1730 (BM, holotype; GH, photo).
Hedysarum tortuosum Swartz, Prodr. 107. 1788. TYPE: Jamaica, *Swartz* (S, holotype; GH, photo).
Meibomia tortuosa (Swartz) Kuntze, Rev. Gen. Pl. 1: 198. 1891.

Meibomia purpurea (Mill.) Vail in Small, Fl. S.E. US. 639. 1903.
Desmodium purpureum (Mill.) Fawcett & Rendle, Fl. Jamaica 4: 36. 1920, non Hook. & Arn. Bot. Beechey's Voy. 62. 1832.

Woody *herb* or *shrub* to 3 feet tall, branching from the base; stems terete, striate, uncinulate pubescent and somewhat pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules obliquely ovate attenuate, long persistent, often reflexed, striate, ciliate, puberulent on the abaxial surface, becoming glabrous, 3–12.5 mm long, 1–7 mm wide; petioles sulcate, ridged, pubescent as the stem, 0.75–5 cm long; leaf rachis similar, 0.45–2 cm long; stipels lance attenuate, striate, ciliate, puberulent, 1–7 mm long; petiolules stouter than leaf rachis, densely stiff pilose, 1–2.5 mm long; leaflets elliptic to ovate, mostly obtuse at the apex, cuneate at the base, with prominently reticulate venation, sparsely to moderately uncinulate puberulent and pilose on both the surfaces, ciliate, the terminal leaflet 2.4–8 cm long, 1–2.7 cm wide, the lateral leaflets 2–5 cm long, 1–2.4 cm wide. *Inflorescences* axillary and terminal, racemose to racemose paniculate; rachis striate, uncinulate puberulent, moderately to densely and finely glandular pilose, becoming less densely so in age; primary bracts, each subtending 2 to more pedicels, narrowly ovate attenuate, striate, ciliate, minutely puberulent on abaxial surface, 5–6.5 mm long, 0.5–1.5 mm wide; secondary bracts, each subtending 1 pedicel, similar, smaller, ca. 2 mm long and 0.4–0.5 mm wide; pedicels with pubescence similar to that of rachis, stiff and ascending to spreading at maturity, 1–1.6 cm long. *Flowers* with the calyx minutely puberulent and abundantly pilose throughout, the teeth of both lobes ciliate, the central tooth of the lower lobe long attenuate, 3–4 mm long, the lateral teeth 2–3 mm long, the upper bifid lobe 2–3 mm long; standard obovate, slightly retuse at the apex, gradually narrowed to the base, 2.5–3.5 mm long, 2 mm wide, the wings obtusely oblong, auriculate and short unguiculate, 2.5–3.5 mm long, 1–1.5 mm wide, the keel petals obliquely oblong, broader above, unguiculate about ⅓ their length, 3–4 mm long, 1 mm wide. *Loment* 5–7-articulate, stipitate, the isthmi central; stipe 0.5–1 mm long; articles mostly orbicular, sometimes with the margins alternately revolute and appearing rhomboidal, uncinulate pubescent throughout, 3–3.5 mm long, 2.6–3.5 mm wide; seed reniform, 1.5 mm long, 1 mm wide.

Desmodium tortuosum ranges throughout subtropical and tropical America. It is found as an escape from cultivation and becomes weedy in most tropical areas of the world.

The thick leaflets with prominently reticulate venation, the large persistent stipules and the long, stiff, ascending to spreading pedicels distinguish *Desmodium tortuosum* most easily from its relatives. This species is grown as a green manure in the southeastern United States and other parts of the world.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 197* (GH, US). Lincoln Creek, Changuinola Valley, *Dunlap 482* (US). Bocas, *Lazor et al. 2325, 2334* (both FSU, SCZ). Without other locality, *Wedel 379* (GH, MO). Isla Colón, 0–120 m, *Wedel 551* (GH, MO). CANAL ZONE: Coastal Island beyond Fort Amador, *D'Arcy 9235* (MO). Ancón Hill, *Duke 4620* (MO). Old Miraflores bridge, *Dwyer 1013* (MO). Farfan Beach, *Dwyer 6799* (MO). Frijoles, *Ebinger 308* (GH, MO). Madden Dam, *Ebinger 848* (GH, MO). Ancón, *Greenman & Greenman 5014* (MO), *5017* (DUKE, MO). Between Frijoles and Monte Lirio, 30 m, *Killip 12166* (GH, NY, US). Balboa, *Macbride & Featherstone 46* (US). Gamboa, *Piper 5188* (US). Balboa, *Standley 25522, 25562, 25654* (all US), *Standley 27001* (MO, US). Near Gatún, *Standley 27333* (US). Corozal, *Standley 27360* (US). Frijoles, *Standley 27636* (US). Gamboa, *Stan-*

dley 28345 (US). Río Pedro Miguel near East Paraíso, *Standley 30027* (C, US). Ft. Sherman, *Standley 31161* (C, US). Darien Station, *Standley 31532* (US). Obispo, *Standley 31783* (US). Balboa, *Standley 32106* (US). Barro Colorado Island, *Standley 40950* (US). Miraflores Locks area, *Tyson 1127* (SCZ). Ft. Amador causeway island, *Tyson 5415* (FSU, SCZ). Near Playa Venado, *Wilbur & Teeri 12965* (DUKE). COCLÉ: El Valle de Antón, 1000–2000 ft, *Lewis et al. 2521A* (MO). COLÓN: Colón, *Rose 22077* (GH, NY, US). DARIÉN: Boca de Cupe, 40 m, *Allen 913* (GH, MO, US). Río Pirre, *Duke 4967* (MO). Río Pirre near crossing of trail from El Real to Tucutí, *Duke 5193* (MO). Ascent of Cerro Pirre from Río Pirre S of El Real, 750–1030 m, *Duke 5363* (MO). El Real, *Lazor & Correa 3372* (FSU). LOS SANTOS: Pocrí, *Dwyer 2521A* (A), *2521B* (MO). PANAMÁ: Punta Chame, *D'Arcy 10238* (MO). Taboga Island, *Dwyer 2813* (MO); *Killip 3183* (US); *Standley 27964* (US).

23. **Desmodium triflorum** (L.) DC., Prodr. 2: 334. 1825.

Hedysarum triflorum L., Sp. Pl. 749. 1753. TYPE: Herb. Linnaeus (LINN 921.45).
H. stipulaceum Burm., Fl. Ind. 168. *tab. 54, fig. 2.* 1768.
Aeschynomene triflora (L.) Poir. in Lam., Encycl. Méth. Bot. 4: 451. 1798. ("*Aeschinomene*")
Pleurolobus triflorus (L.) St. Hil., Nouv. Bull. Soc. Philom. 3: 192. 1812.
Hedysarum granulatum Schum. & Thonn. in Schumacher, Beskr. Guineiske Pl. 362. 1827; Danske Vid. Selsk. Naturv. Afhndl. 3: 136. 1829; Schubert, J. Arnold Arbor. 44: 294. 1963.
Desmodium bullamense G. Don, Gen. Syst. 2: 294. 1832.
Desmodium triflorum var. *β. minus* Wight & Arn., Prodr. 1: 229. 1834.
Desmodium triflorum var. *γ. villosum* Wight & Arn., Prodr. 1: 229. 1834.
Hippocrepis humilis Blanco, Fl. Filip. 585. 1837.
Desmodium caespitosum Bojer, Hort. Maurit. 10. 1837.
Desmodium granulatum (Schum. & Thonn.) Walp., Repert. 1: 737. 1842.
Desmodium stipulaceum (Burm.) Hassk., Cat. Pl. Hort. Bot. Bogor. 274. 1844.
Desmodium parvifolium sensu Blanco, Fl. Filip., ed. 2. 408. 1845, non DC. *fide* E. D. Merrill, Species Blancoanae 183. 1918.
Nicolsonia reptans Meisn. Linnaea 21: 260. 1848.
Nicolsonia reptans Hook. f. & Benth. in Hook., Niger Fl. 304. 1849.
Sagotia triflora Duchass. & Walp., Linnaea 23: 738. 1850.
Nicholsonia triflora Griseb., Goett. Abhandl. 7: 202. 1857.
Meibomia triflora Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *α. glabrescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *α. glabrescens* forma *coerulescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *α. glabrescens* forma *purpurea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *α. glabrescens* forma *violacea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *β. pilosa* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *β. pilosa* forma *violacea* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *β. pilosa* forma *flavescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Meibomia triflora var. *β. pilosa* forma *virescens* Kuntze, Rev. Gen. Pl. 1: 197. 1891.
Desmodium triflorum var. *pigmaeum* Hoehne, Comm. Linh. Telegr. Matto Grosso, Ann. 5. Bot. 8: 73. (1917) 1919.

Low creeping *herbs* often with several stems from the base or rooting at the nodes, suggesting a species of *Trifolium* in habit and aspect; stem terete and striate to angulate, moderately to abundantly long white pilose. *Leaves* trifoliolate, stipulate, petiolate; stipules stramineous, obliquely ovate, long acuminate, truncate at the base, striate, somewhat pilose on the abaxial surface, ciliate, long persistent, 2–3.5 mm long, 1–1.5 mm wide; petioles sulcate adaxially, long pilose and minutely uncinulate puberulent, 3–7.5 mm long; leaf rachis similar 1–2 mm long; stipels inconspicuous, ca. 0.5 mm long, petiolules stouter than the leaf rachis, densely pilose, 0.5–1 mm long; leaflets obovate, retuse and sometimes nearly truncate at apex, cuneate at base, essentially glabrous adaxially, abundantly pilose and minutely uncinulate puberulent on the abaxial surface or pilose, terminal leaflet 5–10 mm long, 5–11 mm wide, the lateral leaflets similar or more nearly elliptic, 4–7.5 mm long, 4–8 mm wide. *Inflorescences* axillary, densely compressed, usually composed of 3–4 pairs of flowers; primary bracts ovate,

short acuminate, striate, ciliate, long persistent, 2.5–3 mm long, 0.7–1.5 mm wide, each subtending 2 pedicels; secondary bracts, when rarely present, depauperate; pedicels densely long pilose or only uncinulate puberulent, 4.5–8 mm long; calyx remotely bilabiate, the teeth of both the lobes equal, each ciliate and with a long pilose, reddish midrib, 2.5–3.5 mm long; corolla with a more or less orbicular but long-unguiculate standard, 3.6–4.5 mm long, 2–3 mm wide above the claw, the wings oblong and long unguiculate, equalling the standard in length, 1 mm wide, the keel petals scythe shaped, long unguiculate, as long as the standard, 1–1.3 mm wide. *Loment* sessile, to 5-articulate, straight or curved on the upper suture, slightly invaginated on the lower; articles uncinulate pubescent throughout, ultimately separating at the wide isthmi, 2.5–4 mm long and wide; seed nearly orbicular, 1.5 mm long and almost as wide.

This species is widespread in tropical areas. It is often introduced and appears as a weed on lawns, but is noted by some collectors as a good lawn plant. It is said to be eaten by cattle.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 303* (US). Changuinola, *Godfrey 67321* (FSU). Almirante, *Lazor et al. 2332* (FSU, SCZ). Bocas, *Lazor et al. 2355* (FSU, MO, SCZ). CANAL ZONE: Frijoles, *Bottimer 1515* (A, DAO). Chagres, *Fendler 84* (GH, MO, US). Between Summit and Gamboa, *Greenman & Greenman 5264* (MO). Barro Colorado Island, *Hladick 89* (MO). Ancón, *Piper 5184* (US). Río Grande near Culebra, 50–100 m, *Pittier 2077* (US). Barro Colorado Island, *Shattuck 195* (MO). Near Gatún, *Standley 27325* (US). CHIRIQUÍ: Between David and Concepcion 0–100 m, *Koster 132* (A). Puerto Armuelles, 20 m, *Liesner 142* (MO). COCLÉ: Aguadulce near sea level, *Pittier 4856* (US). COLÓN: Santa Rita Ridge, 2 mi E of Transisthmian Highway, *Lewis et al. 5241* (MO, SCZ). Portobelo, 5–100 m, *Pittier s.n.* (US); *Rose 23998* (US). PANAMÁ: Madden Dam 75 m, *Allen 789* (GH, MO). San José Island, *Erlanson 589* (GH, US). Sabanas near Chepo, 30 m, *Hunter & Allen 22* (GH, MO). Sabanas NE of Panama City, *Paul 185* (US). Corozal Road near Panama, *Standley 26813* (US). Taboga Island, *Standley 27098* (MO, US). Hospital del Seguro Social, *Taylor 64* (PMA).

24. **Desmodium wydlerianum** Urban, Symb. Ant. 2: 302. 1900; Schubert, Contr. Gray Herb. 129: 29, *pl. 2, figs. D1–7.* 1940. TYPE: Portorico parte orientale: *Wydler 140* (G, holotype; F, GH, isotypes).

D. spirale β. stoloniferum (Poir.) DC., *sensu* DC., Prodr. 2: 333. 1825. TYPE: Porto Rico, *Bertero* (G-DC; GH, photo).

D. lunatum Huber, Bol. Mus. Paraense Hist. Nat. 4: 568–570, *fig. 2.* 1906; non Brandegee 1908. TYPE: Brazil, Chinganilla (Pampa del Sacramento), *Huber 15* (not seen, but fig. 2 agrees well with material of *D. wydlerianum*).

Meibomia lunata (Huber) Hoehne, Anexos. Mem. Inst. Butantan Secc. Bot. 1: 39, *tab. 14.* 1921.

M. wydleriana (Urb.) Britt., Sci. Surv. Porto Rico & Virgin Isl. 5: 403. 1924.

Slender *subshrubs*, to 4 dm or more, often repent, the stem rooting at the nodes, angulate, striate, uncinulate puberulent. *Leaves* trifoliolate, stipulate, petiolate; stipules elliptic acuminate, striate, uncinulate puberulent over the abaxial surface, ciliate, to 6 mm long, 1.5 mm wide; petioles sulcate on the adaxial surface, striate, uncinulate pubescent and sparsely pilose, 5–4.5 cm long, the leaf rachis similar, more slender, 1.4–1.6 cm long; stipels lance attenuate, striate, uncinulate puberulent on the abaxial surface, ciliate, 1.5–3.5 mm long; petiolules stouter than the leaf rachis, densely pilose and uncinulate pubescent, 2.5–3 mm long; leaflets thin, dark green and often with a blotch above, much paler beneath, terminal leaflet ovate acuminate, truncate at the base, with undulate margins, uncinulate puberulent to pubescent on the midrib and the chief lateral veins,

similarly pubescent over the whole surface or glabrescent, pubescence of the abaxial surface similar but less abundant and less conspicuous, 7–8 cm long, 5.5–6 cm wide, the lateral leaflets similar but slightly oblique, 5–6.4 cm long, 3–3.5 cm wide. *Inflorescence* of axillary racemes, rachis angulate, ridged and grooved, uncinulate pubescent; bracts early deciduous, none seen on Panama specimens, primary bracts narrowly ovate, striate, puberulent, ciliate, ca. 1.5 mm long; secondary bracts similar, ⅓ as long; pedicels borne singly, each subtended by 1 primary and 2 lateral secondary bracts, pubescent as the rachis or with sparsely scattered pilosity in addition, 1.2–1.6 cm long. *Flowers* with the calyx uncinulate puberulent throughout, teeth of both the lobes somewhat appressed pilose, the central tooth of the lower lobe 2.5–3.5 mm long, the lateral teeth to 3 mm long, the upper bifid lobe to 3 mm long; standard orbicular to obovate, short unguiculate, to 4.5 mm long, 3.5–4 mm wide, the wings suboblong and short unguiculate, to 4.5 mm long, 1.5–2 mm wide, the keel petals remotely scythe shaped, long unguiculate, 4.5–5 mm long, 2 mm wide. *Loment* stipitate to 3-articulate, the stipe 1–1.5 mm long, the articles densely uncinulate pubescent on the surfaces, the dorsal suture slightly invaginated, the ventral suture rounded, isthmi eccentric and narrow, 7–11.5 mm long, 3–3.5 mm wide; *seed* almost naviculate in outline, 4 mm long, 2 mm wide.

Desmodium wydlerianum occurs in central America, the West Indies and the northern half of South America. Originally described from Puerto Rico, this species has now been found in most of tropical America in humid forests at relatively low altitudes.

The seed measurements noted above were taken from *Skutch 4346* (GH, Costa Rica).

CANAL ZONE: Barro Colorado Island, *Croat 5884, 14983, 17395* (all MO). Las Cruces Trail, *Tyson 1774* (FSU, MO, SCZ). DARIÉN: Río Paya, trail between Paya & Payita, *Stern et al. 362* (GH, MO). Río Paya, trail to Pucro, *Stern et al. 413* (GH, MO, US).

19. DIOCLEA

Richard H. Maxwell[47]

Dioclea H.B.K.,[48] Nov. Gen. Sp. Pl. 6: 437, *tab. 576*. 1824. LECTOTYPE: *D. sericea* H.B.K.

Vines, woody, in clumps, or high-climbing lianas. *Leaves* trifoliolate, the lateral leaflets usually smaller than the terminal, the margins entire, revolute, with variable pubescence; stipels setaceous to filiform; stipules lanceolate or triangulate, produced below insertion or non-produced. *Inflorescences* erect, usually single and axillary, fasciculate racemose, tuberculate; bracts linear to triangulate, persistent to caducous; bracteoles ovate, flabellate to orbicular, persistent or caducous. *Flowers* shades of violet, purple and blue; calyx tube 4–5 lobed, pubescent within, glabrous or variously pubescent without, the upper lobes partially or completely fused; lamina of the standard oblanceolate to somewhat orbicular,

[47] Indiana University Southeast Herbarium, 4201 Grant Line Road, New Albany, Indiana 47150.

[48] Several generic synonymies are listed by Hutchinson, *Genera of Flowering Plants* 1: 426. 1964. None of these names applies to Panamanian material.

emarginate, basally biauriculate and usually bicallose, glabrous or puberulent, carnose or membranous, the wings free, the lamina obliquely oblong to obliquely ovate, auriculate, occasionally with a spur, the keel petals fused distally, the lamina triangulate to somewhat obliquely oblong, auriculate; stamens 10, the vexillary filament free ca. 3 mm, basally, then fused to the staminal sheath, all the filaments free distally, the anthers dimorphic or monomorphic; pistil compressed, geniculate, the ovary villous, the upper style glabrous, the stigma capitate, glabrous. *Fruits* oblong, flat, compressed or turgid, with variable dehiscence, pubescence variable; seeds large, few, soft-cuboidal or hard-turgid; if small, then many, hard and flat, oblong to sub-orbicular; the hilum linear or short-oblong, encircling ca. $^1/_5$ to nearly ½ or to ca. ¾ the testa.

Dioclea is a pantropical genus of about 50 species with the great majority in tropical South America.

Literature:

Pittier, H. 1944. Leguminosas de Venezuela, I. Papilionáceas. Min. Agric. Cria. Ser. Bot. Bol. Téc. 5. Caracas.

Burkart, A. 1970. Las Leguminosas Faseólas argentinas de los géneros *Mucuna*, *Dioclea* y *Camptosema*. Darwiniana 16: 175–218.

a. Large coarse vines, frequently high-climbing forest lianas; stipules large, produced; anthers dimorphic (5 perfect and 5 imperfect); bracts from 6–20 mm long, caducous or occasionally semipersistent; seeds large, turgid or compressed, 1–4(–5); lamina of the standard carnose, glabrous; keel petals rostrate.
   b. Fruits turgid, fleshy; seeds soft, cuboidal, the hilum encircling ca. ½ the testa; leaflets with the primary lateral veins in 10–14 pairs, the apices abruptly elongate; bracts 6–10 mm long; keel petals sharply beaked or hooded.
      c. Leaflets papyraceous, non-rugose above, sparsely pubescent below; calyx yellowish, sparsely pubescent with short, dark brown hairs; pedicels ca. 9 mm long; stipules ca. 15 mm long ---------- 5. *D. pulchra*
      cc. Leaflets coriaceous, rugose above, densely pubescent below; calyx darker, with dense ferruginous pubescence; pedicels ca. 5 mm long; stipules ca. 25 mm long ---------- 1. *D. aurea*
   bb. Fruits coriaceous to ligneous; seeds hard, globose, the hilum encircling $^2/_3$–$^4/_5$ the testa; leaflets with the primary lateral veins in ca. 8(–10) pairs, apices usually acute; bracts 15–30 mm long; keel petals with obtuse or truncate beaks.
      d. Flowers 2.3–3.0 cm long, borne on pedicels ca. 7 mm long; fruits ca. 3 cm thick, the upper suture paralleled by thick ribs, the lower margin somewhat constricted between the seeds, the exocarp obliquely fissured; the bracts spreading, to ca. 30 mm long, ciliate; seeds ca. 2 cm thick, reddish, frequently with a scale-like piece of rim aril persisting ---------- 3. *D. megacarpa*
      dd. Flowers 1.5–2.0 cm long, borne on pedicels 2–6 mm long; fruits ca. 2 cm thick, the upper suture paralleled by thin wings, the lower margin non-constricted between the seeds, the exocarp without distinct oblique fissures; bracts erect or reflexed, 9–20 mm long, with appressed pubescence; seeds ca. 1.5 cm thick, dark, frequently with a woody piece of funiculus persisting.
         e. Inflorescences, flower buds and young fruit indumentum nigrescent ferruginous; bracts erect, linear, caducous; fruits with the pedicel attachment at the upper suture, the upper margin usually straight; bracteoles usually caducous ---------- 8. *D. wilsonii*
         ee. Inflorescences, flower buds and young fruit indumentum fulvous, occasionally ferruginous; bracts reflexed, usually lanceolate, semipersistent; fruits with the pedicel attachment median, the upper margin frequently downcurved distally; bracteoles usually persistent ---------- 6. *D. reflexa*

aa. Smaller woody vines (except *D. paniculata*), frequently in clumps in open scrub or forest edges; stipules small, non-produced; anthers uniform (10 perfect); bracts ca. 3 mm long, persistent; seeds small, flat, 5–12 (except 2–4 in *D. paniculata*); lamina of the standard membranous, puberulent or glabrous; keel petals not rostrate.
  f. Smaller woody vines, frequently common in open areas; leaflets papyraceous; flowers 15–25 mm long, standard puberulent; inflorescences usually single; fruits oblong, the upper suture paralleled by distinct ribs or wings to either side; seeds oblong rounded, 5–12, the hilum long linear.
    g. Calyx tube glabrous; pedicels usually longer than 5 mm long; bracteoles suborbicular, 6–10 × 4–6 mm, caducous; keel petals with the median portion of the upper margin fimbriate ..... 7. *D. virgata*
    gg. Calyx tube pubescent; pedicels ca. 5 mm long, usually less; bracteoles lanceolate to ovate, ca. 3 × 2 mm, persistent or caducous; keel petals with a wide median portion of the upper margin variously dentate or serrate ..... 2. *D. guianensis*
  ff. Higher climbing lianas, along rivers or in moist forest areas; leaflets rigid, brittle; flowers 10–12 mm long, standard glabrous; inflorescences single, double or occasionally branched; fruits usually elliptic, the upper suture paralleled by shallow ribs ca. 1 mm to either side; seeds oval, 2–4, the hilum short oblong ..... 4. *D. paniculata*

1. **Dioclea aurea** R. H. Maxwell[49]. TYPE: Colombia, *Sneidern 5555* (S, holotype).

Vines, coarse, twining, climbing; stems terete, with hirsute, fulvous ferruginous pubescence. *Leaves* with leaflets coriaceous, the lamina broadly ovate, the terminal leaflet to ca. 17 cm long, 14 cm wide, the laterals to ca. 14 cm long, 11 cm wide, inequilateral, the upper surface rugose, glabrous except the midrib, the lower surface with dense, fulvous ferruginous or aureus erect trichomes of various lengths, the apices abruptly acute, the apex ca. 7 mm long, the bases rounded to cordate, the primary lateral veins in 11–14 pairs; petioles to 11 cm long, the rachis to 5 cm long, both fulvous hirsute; stipules to 15 mm long distally, probably 10 mm long below insertion (broken), striate, villous outside, sparsely pilose inside; stipels filiform, 5–10 mm long, pubescent. *Inflorescences* axillary, ca. 20 cm long, ferruginous tomentose, flowering ⅔ of length; tubercles short clavate with globose heads; bracts lanceolate, ca. 6 mm long, hirsute ferruginous outside and inside, caducous; bracteoles oval, ca. 4 × 4 mm, ferruginous pubescent outside, glabrous inside, persistent, with similar bractlets; pedicels ca. 5 mm long. *Flowers* with buds upcurved slightly at the calyx lobes, flowers ca. 1.8 cm long, calyx tube ca. 8 mm long with dense ferruginous pubescence, fulvous velutinous inside and extending up the lobes, the upper lobe blunt, emarginate, ca. 5 mm long, 10 mm wide, the lateral lobe lanceolate falcate, ca. 7 mm long, 4 mm wide, the lower lobe lanceolate, ca. 8 mm long, 3 mm wide; standard obovate, ca. 15 mm long, 9 mm wide with a claw ca. 4 mm long, the wings narrowly obovate, ca. 18 mm long, 9 mm wide with a claw ca. 6 mm long, the keels semiorbicular, ca. 10 mm long with a claw ca. 4 mm long, the upper margin basally auriculate with a supramedian lobe, the lower margin rising distally ca. 9 mm, culminating in a hooded beak; stamens 10, the base of the vexillary filament free ca. 3 mm, sparsely pubescent, the vexillary and alternate anthers of the staminal sheath imperfect, less than 0.5 mm long, perfect anthers ca. 1 mm long; pistil straight, ca. 11 mm, geniculate, rising distally ca. 9 mm, the ovary ca. 7 mm long, subsessile, fulvous

[49] *Dioclea aurea* Maxwell, spec. nov. Frutex scandens, magnus, grossus, caulibus hirsutis, ferrugineis. Folia stipulis productis, foliolis coriaceis, pagina supra rugosa, infra dense pubescente, pilis erectis fulvi-ferrugineis, venis latualibus primarius paribus 12–14 disposites. Legumina carnosa, turgida, seminibus paucis, mollis.

canescent, the hairs to 2 mm long, 3–4-ovulate, the style frequently ?twisted, the lower style not swollen, with long, strigose hairs, the upper style glabrous, ca. 5 mm, the stigma capitate, terminal. *Fruits* turgid, fleshy, oblong, to ca. 9 cm long, 4.6 cm wide, 4.5 cm thick, probably indehiscent, the exocarp yellow brown with erect ferruginous hairs, the sutures indistinct; seeds 1 to few, soft, overgrown, probably similar to *D. pulchra,* with the hilum nearly ½ encircling.

Dioclea aurea resembles *D. pulchra* in the hooded beak of the keel petals, the relatively small bracts and stipules, and the fruits and seeds. The primary differences are in the leaflets and indumentum, with *D. aurea* possessing coriaceous and rugose leaflets and a coarser, more dense indumentum.

The new species is closely related to other Colombian collections which exhibit a kind of indeterminate growth in the inflorescences, bracts and even calyx lobes. This plasticity characterizes *Dioclea* as a whole.

The fruit description is based on the Panama collection and the floral description on the Colombian collections cited.

PANAMA. DARIÉN: Cloud Forest, Casí-Caná trail on Cerro Campamiento, E of Tres Bocas, headwaters of Río Cuasi, *Kirkbride* (*& ?Duke*) *1257,* (MO). COLOMBIA. CALDAS: Pueblo Rico, La Selva, 1500 m, *Sneidern 5427, 5555* (both S).

2. **Dioclea guianensis** Benth., Comm. Legum. Gen. 70. 1837. (Ann. Wiener Mus. Naturgesch. 2: 134. 1839.) TYPE: Guyana Parima Mts., *Schomburgk 83* (K, holotype; G, F, US, W, isotypes).—FIG. 22.

D. panamensis Duchass. & Walpers ex Walpers, Flora 36: 229. 1853. TYPE: Panama, *Duchassaing* (GOET), non Seemann (1880).

D. comosa (Meyer) Kuntze var. *panamensis* (Walpers) Kuntze, Rev. Gen. Pl. 1: 179. 1891. TYPE: Panama, *Kuntze 691* (NY).

Vines of open areas and forest edges; stems with fuscous pubescence. *Leaves* with leaflets lanceolate, rhomboid to oblong, 7–10 × 4–6 cm, the apex acute, pubescent or glabrous above, usually pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 6 pairs; petioles 4–6 cm long, with the rachis 1–7 mm long, densely puberulent, the stipels to 2 mm long; stipules triangulate, ca. 3 mm long, not produced. *Inflorescences* slender, to ca. 60 cm long, flowering ca. ½ the length, the tubercles sessile or short clavate with globose heads, indumentum canescent fuscous; bracts narrowly ovate to triangular, ca. 3 × 2 mm, usually persistent; bracteoles ovate, ca. 3 × 2 mm, mostly persistent; pedicels 2–5 mm long. *Flowers* 1.5–2.0 cm long, the calyx tube 6–10 mm long, membranous, sparsely sub-strigose without, canescent velutinous or subtomentose within, the upper calyx teeth fused, entire, the upper lobe obtuse, to ca. 9 mm long, the lateral lobes acute to lanceolate, to ca. 8 mm long, the lower lobe linear lanceolate to lanceolate, to ca. 9 mm long; standard orbicular or obovate, membranous, puberulent apically, bicallose or ecallose, 10–20 mm long, weakly biauriculate with a claw 2–7 mm long, the wings obliquely obovate, 10–22 mm long, usually spurred, the claw 3–6 mm long, the keel obliquely oblong, 10–18 mm long, 4–9 mm wide distally, weakly auriculate, the claw ca. 4 mm long, the upper margin variously serrate medially, not rostrate; staminal sheath and pistil subsigmoidal, the anthers perfect, monomorphic; ovary 8–12 mm long, ca.

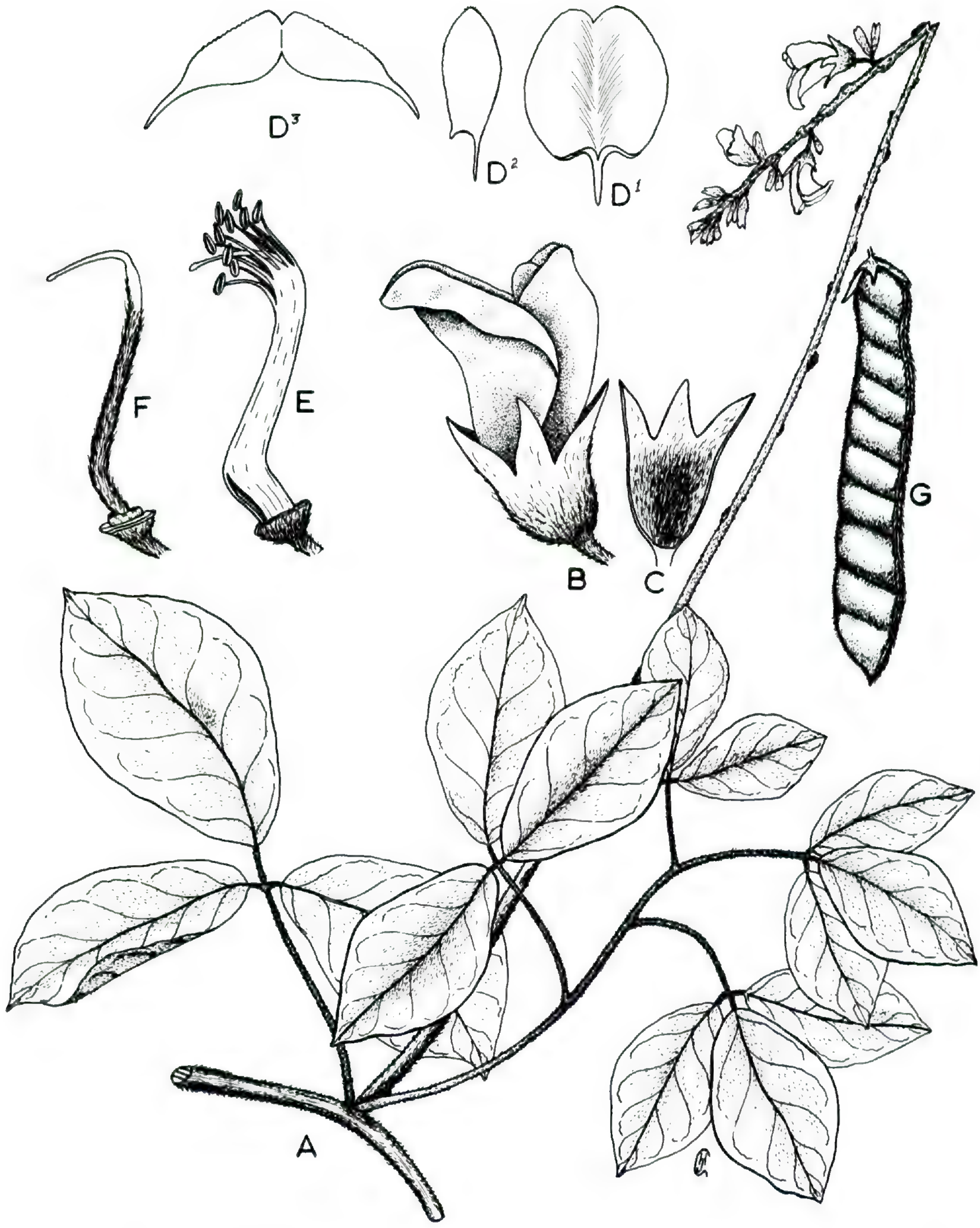

FIGURE 22. *Dioclea guianensis* Benth.—A. Habit (×¼). [After *Allen 4149.*]—B. Flower (×¾).—C. Calyx (×¾).—D. Corolla.—D^1. Standard (×½).—D^2. Wing petal (×½).—D^3. Keel petals (×½).—E. Stamens (×1).—F. Pistil (×1). [After *Greenman 5133.*]—G. Fruit (×¼). [After *Allen 1.*]

1.3 mm wide, short stipitate, canescent or sub-velutinous, 8–13-ovulate, the style glabrous, ca. 6 mm long. *Fruits* compressed, oblong, ca. 10 × 1.0–1.4 × 0.4 cm, the upper suture paralleled by thin wings or slightly thicker ribs, the lower swollen; seeds 5–11, flat, elliptic oblong, 7–12 × 4–6 × 2 mm, hard, reddish brown, frequently maculate, the hilum encircling nearly ½ the testa.

Dioclea guianensis is distributed through Central America into Mexico, northern and northwestern South America, as well as Trinidad.

The type of *Dioclea guianensis* has small flowers. Panamanian specimens show a size ranging from over 1.5 cm to slightly over 2 cm in length. As the flower size increases the orbicular standard shape becomes oblong or obovate and the wings tend to assume shapes oblanceolate rather than obliquely oblong, but the spur or the protuberance opposite the auricle tends to remain. Panamanian material also shows a pubescence on the undersurface of the leaflets that is sparse and erect rather than the denser appressed to dense sericeous pubescence of some Guyanan specimens. There are variants in Belize with flowers approaching 3 cm long that I have not seen in Panama.

Pittier in 1944 and afterwards attempted to segregate several species from the *D. guianensis* complex, but he did not supply Latin diagnoses for the names, leaving them not validly published. After an extensive study of the specimens he examined, I conclude that to recognize these taxa is untenable taxonomically and would serve no useful purpose. Our primary area of disagreement is in the weight placed on flower size and indumentum. I place little weight on these characters because of the tremendous variance present. All the *D. guianensis* specimens I have seen from Panama can be grouped under var. *guianensis* sensu lato.

Dioclea guianensis can be separated from *D. virgata* by its ovate bracteoles, pubescent calyx, serrate upper keel margin, and smaller, narrower fruits. *Dioclea guianensis* is distinguished from *D. paniculata* in its more open habitat, habit, larger flower size, serrate upper keel margin, papyraceous leaflets, somewhat oblong seed shape, and linear hilum.

WITHOUT EXACT LOCALITY: *Duchassaing* (GOET, P); *Kuntze 691* (NY); *Seemann* (BM); *Seemann 461* (GOET-mounted sheet, mixture in envelope). BOCAS DEL TORO: Río Changuinola, *Dwyer 4078, 5752* (both MO). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 4841, 7147* (both MO); *Shattuck 134* (MO); *Wetmore & Abbe 61* (F); *Wilson 123* (MO); *Woodworth & Vestal 691* (LE, MO), *726* (A, MO). Pedro Miguel, *Allen 1* (BR, G, F, MO, U). Between Miraflores & Panama, *Blum 2069* (FSU, MO). Cerro Ancón, *Celestine 74* (US). Dirt road to Chiva-Chiva town, *Correa 493* (FSU, MO). Gaillard Highway NW of Summit Gardens, *Croat 8883* (MO). 2.5 mi N of Summit Gardens, *Croat 12833* (F, MO). Gaillard Highway near Gamboa, *Croat 13139* (MO). 1–2 mi NW of Summit Gardens, *Croat 13917, 14045* (both MO). K-10, *Duke 15194* (MO). Fort Sherman, beach, *Dwyer 6585* (SIU). C-21 Road, *Dwyer 8382* (MO, SIU). Ancón Hill, *Greenman & Greenman 5133* (MO). ½ mi W of Summit Gardens, *Hansen 3008* (MO). Summit, *Hayes* 9 Feb. 1862 (BM). Empire Station, *Hayes 562* (BM, M). Hill W of Curundú, *Harvey 5233* (F). Gamboa, *Heriberto 86* (US). Without other locality, *Hicken 1907* (SI). Military Road near Summit Gardens, *Hladik 133* (MO). Las Cruces trail, *Hunter & Allen 766* (G, MO). Without exact location, *Johansen* Jul. 1924 (US). Gamboa Road, *Jones 307* (US). ½ mi N of Gamboa, *Lazor & Tyson 5659* (MO). 2 mi N on Panamerican Highway towards Nuevo Emperador, *Lewis et al. 5222* (MO). Chiva-Chiva Trail 2 mi above Red Tank, *Maxon & Harvey 6592* (US). 1½ mi N of Summit Gardens, *Nee 9515* (MO). Between Rodman Marine Base & Chorrera, *Nowicke et al. 3578* (MO). Chiva-Chiva Trail Red Tank to Pueblo Nuevo, *Piper 5174* (F, NY, US). Empire to Mandinga, *Piper 5175* (US). Culebra, *Pittier 2148* (US). Between Corozal & Ancón, *Pittier 2176* (NY, US). Summit, *Standley 26908* (US). Old Las Cruces Trail between Ft. Clayton & Corozal, *Standley 29107* (US). Balboa, *Standley 29296* (US). Río Pedro Miguel near East Paraíso, *Standley 30020* (US). Summit, *Standley 30097* (A, US). Road K-9 near Río Cocolí, *Stern et al. 31* (MO). Quebrada Bonita, *Steyermark & Allen* 27 Dec 1934 (MO). 5 mi N of Cocolí, *Tyson 3878* (MO). Miraflores Lake, *White 192* (MO, US). Ancón Hill, *R. S. Williams 25* (MO, US). BOCAS DEL TORO: Río Changuinola, *Dwyer 4078, 5752* (both MO). CHIRIQUÍ: Near Remedios, *Burt & Koster 166* (MO). 12.4 mi N of David, *Lewis et al. 697* (MO, NY, UC, US). Boca Chica, *Pittier 5121* (US). COCLÉ: Antón-Penonomé roadside, *Burt & Rattray 48* (MO). 3 mi NE of Antón, *D'Arcy 4109* (MO). Penonomé, *Dwyer 2030* (SIU). 2 mi E of Río Hondo, along Panamerican Highway, *Gentry 2913* (MO). 7.5 mi from Penonomé towards Caimito, *McDaniel & Cook 14816* (MO). Penomoné, *R. S. Williams 365* (NY, US). COLÓN: Río Chagres, above Gamboa, *Allen 4149* (G, MO). Calzada Larga, *de Gracia*

11 (MO). PANAMÁ: Campana, *Allen 4033* (G, MO). Cerro Azul, *Cotterman & Klawe P-15* (MO, US). Isla del Rey, *Duke 9563* (MO). Between Río Sulugandí & Río Espavé, *Gentry 4983* (MO). Lídice near the river, *Jaramillo 14* (FSU). Savanas of Río Yguana, *J. F. Macbride 2630* (F, US). Panamerican Highway at Continental Divide, *Nee 8289* (MO, US). Sabanas N of Panama City, *Paul 600* (US). La Chorrera, *Paz 20* (MO). Bella Vista, *Piper 5176* (US). Sabana de Juan Corso near Chepo, *Pittier 4741* (BM, NY, US). Cerro Campana, *Porter et al. 4298* (MO). Between Río Pacora & Chepo, *Porter et al. 5159* (MO). Punta Paitilla, *Standley 26228* (US). Juan Franco Race Track, *Standley 27767* (US). Río Tapia, *Standley 28182* (US). Matías Hernández, *Standley 28912* (US). Tumba Muerto Road, *Standley 29786* (US). Juan Díaz, *Standley 30551* (US). Between Matías Hernández & Juan Díaz, *Standley 32010* (US). Road to Monte Oscuro, *Varela 26* (MO).

3. **Dioclea megacarpa** Rolfe, Kew Bull. 139. 1901. TYPE: Trinidad & Tobago, Trinidad, St. Annes, ?Cangrehol, *Hart 6406* (K, lectotype; photos C, F, NY, S, SI of type at K).

D. reflexa, sensu Fawcett & Rendle, Fl. Jamaica 4(2): 59, *tab. 18*. 1920. non Hook. f. See Amshoff loc. cit.

Vines, coarse, high climbing; stems pilose. *Leaves* with the lamina broadly elliptic to obovate orbicular, to ca. 20 cm long, 12 cm wide, the apex with an abrupt acumination, ca. 3 mm long, usually pubescent above, often rough with persistent hair bases, sparsely velutinous below, chartaceous, slightly cordate at the base, the lateral veins oblique, the primary lateral veins in 7–10 pairs; petioles sparsely pilose, the rachis to ca. 5 cm long, stipels 4–7 mm long; stipules lanceolate, to 35 mm long, including region below insertion, densely pilose outside. *Inflorescences* stout to ca. 70 cm long, flowering on ½ the length, the tubercles sessile, the indument ferruginous; bracts linear lanceolate, ca. 20 mm long, finally caducous, spreading or somewhat reflexed, pilose; bracteoles flabellate to orbicular, 2–4 × 2–4 mm, ferruginous without, persistent; pedicels ca. 7 mm long. *Flowers* with the buds somewhat incurved, the flowers ca. 2.5 cm long, occasionally to ca. 3 cm long; calyx tube 12–15 mm long, carnose, ferruginous pubescent without, velutinous within, the upper calyx lobes partially fused, emarginate, ca. 7 mm long, 10 mm wide, the lateral lobes acute, ca. 7 mm long, the lower lobe lanceolate, ca. 10 mm long; lamina of the standard obovate orbicular, carnose, glabrous, bicallose, to ca. 25 mm long, the auricles semi-orbicular, reflexed, the claw ca. 5 mm long, the wings broadly obliquely oblong, to ca. 25 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 8 mm long, ca. 9 mm wide distally, auriculate, the claw ca. 5 mm long, the upper margin slightly undulate, culminating in a truncate beak; stamens 10, the vexillary anther and the inner alternate anthers of the staminal sheath imperfect, the perfect anthers ca. 0.5 mm long; ovary short stipitate, villous, 2–4(–5)-ovulate, the upper style glabrous, ca. 5 mm long, the lower part bulbous. *Fruits* oblong, frequently somewhat arcuate, ca. 18 × 6 × 3 cm, partially dehiscent, the fuscous pubescence usually persistent, the upper suture indehiscent, paralleled by the thick ribs, the lower margin truncate, frequently constricted between the seeds, the suture becoming sulcate, the exocarp with oblique fissures; seeds (1–)3–4(–5), sub-orbicular, ca. 3 × 3 × 2 cm, hard, reddish, the hilum encircling nearly ⅔ the testa.

Rolfe's syntypes included collections from Paraguay. These syntypes were removed by Hassler and others were added to form the basis of *Dioclea paraguariensis* Hassl., Fedde, Rep. Spec. Nov. 16: 228. 1919. Burkart (1952) placed

D. paraguariensis in synonymy under the name *D. megacarpa* Rolfe, but after reexamining the 2 taxa, he restored *D. paraguariensis* to species rank as separate from the more northern *D. megacarpa*. See Burkart (1970), in Darwiniana 16(1–2): 182–186, Figs. 4, 5, for his explanation and excellent illustrations of *D. paraguariensis*. I am not as sure that *D. paraguariensis* and *D. megacarpa* are distinct taxonomically although I have not found where their distribution overlaps. I have also found that *D. violacea* Mart. ex Benth. (1839) with *Pohl 338* (W) as lectotype is an earlier name for *D. paraguariensis* Hassl. (Note synonymy under *D. wilsonii* below). It seems best to maintain *D. megacarpa* as a good species.

The long spreading bracts, large flowers, fruits, fruit sutures, exocarp, and large reddish seeds, frequently with a papery, persistent piece of rim aril, are characters which distinguish this taxon. (Useful reference: Janzen, D. H. 1971. Escape of Juvenile *Dioclea megacarpa* (Leguminosae) Vines From Predators in a Deciduous Tropical Forest. Am. Natur. 105: 97–112.) Duke reports the native name "Ojo de Buey."

CANAL ZONE: Gov. Reservation, Ancón, *Bangham 608* (A). COCLÉ: Llano Bonito, N of Margaritas, *Seibert 540* (A, MO, NY). DARIÉN: Chepigana, *Duke & Bristan 268* (MO, NY, US). PANAMÁ: Common along the beach, *Dwyer 1685* (MO). San José Island, *Erlanson 408* (G, NY, US); *Harlow 3* (US); *Johnston 53* (US), *360* (GH), *568* (US). Punta Paitilla, *Standley 30814* (US). SAN BLAS: Isla Pino near Mulatupo Island, *Elias 1707* (MO, SIU, US), *1715* (MO).

4. **Dioclea paniculata** Killip ex R. H. Maxwell, Phytologia 40: 243. 1978. TYPE: Colombia, Cundinamarca, Quebrada Cabana, Hacienda El Cucharo between Tocaima and Pubenza; 380–600 m, *Killip et al. 38329* (US, holotype; COL, US, isotypes).

Twining *vines*, high climbing; stems terete, sparsely pubescent. *Leaves* with the lamina widely lanceolate, elliptic, ovate, occasionally obovate, 6.5–14 cm long, 2.5–8 cm wide, the lateral leaflets smaller, inequilateral, the apices acute, obtuse or abruptly acuminate with the extension 10–15 mm long, the bases rounded, occasionally slightly cordate, the upper surface shining or dull, glabrous, sparse pubescent below or with a few hairs on the primary veins, with ca. 6 pairs of primary lateral veins; rachis 7–18 mm long, $^1/_5$–$^1/_2$ the petiolar length, with dense ferruginous pubescence when young, quickly glabrous; stipels setaceous, ca. 1 mm long, usually persistent; stipules linear or lanceolate, sometimes deeply bifurcate or trifurcate, the lobes linear, the middle longest, 1.5–4.0 mm long, not produced, frequently with secondary bracts surrounding the emerging inflorescence and leaf cluster. *Inflorescences* terminal or axillary, emerging with the leaves, single, double, occasionally branched, 3–18 cm long; each tubercle with 3–8 flower buds, the tubercles clavate with the heads usually elongate upwards and swollen; primary bract at the base of the tubercle linear lanceolate, ca. 2 mm long, glabrous, caducous; bracteoles ovate to orbicular, ca. 1.8 mm long, semipersistent; flowers subsessile. *Flowers* blue violet to deep purple, 10–12 mm long; calyx tube ca. 3 mm long, ferruginous pubescent, the upper lobes entire or emarginate, the lobes subequal, 1.5–2 mm long; standard with the lamina obovate, weakly auriculate or not callose, striate, ca. 8 mm long, 6.5 mm wide, glabrous, the claw ca. 2 mm long, the wings oblanceolate or somewhat oblong, auriculate,

striate, ca. 6 mm long, 2.5 mm wide, glabrous, the claw ca. 2.5 mm long, the keel petals somewhat oblong to obliquely oblong, ca. 6.5 mm long, 2 mm wide, glabrous, the claw ca. 2.5 mm long, the upper margin entire, not rostrate; vexillary filament often weakly fused to the staminal sheath, the anthers perfect, monomorphic; ovary ca. 6 mm long, short stipitate, densely villous with rigid, white hairs interspersed with dark brown hairs, ca. 5-ovulate, the style upcurved or ascending, glabrous for ca. 2 mm, shortly exserted through the keel petals. *Fruits* elliptic, flat, dehiscent, sessile, 5.5–8.5 cm long, 2.1–2.4 cm wide, 2.5–5 mm thick, exocarp of young fruits with dark brown pubescence, finally glabrous, the upper suture slightly raised with shallow parallel ribs ca. 1 mm to either side, the lower margin somewhat swollen; seeds 2–4, flat, oval, brownish, smooth, shining, ca. 13 mm long, 10 mm wide, 3 mm thick, surrounded by papery, red, packing tissue, the hilum oblong, 2.5–3.0 mm long.

This species is fairly common in Colombia. The Panama collections are not good specimens and most of the species description is from Colombian material.

CANAL ZONE: 4 km W of Gatun Dam, 190–200 m, *Nee 8911* (MO, PMA). COLÓN: 15 km E of Colón, Santa Rita lumber road, *Dressler 3797* (MO).

5. **Dioclea pulchra** Moldenke, Phytologia 1(1): 6. 1933. TYPE: Colombia, Boyaca, El Umbo & Mt. Chapon region, *Lawrance 528* (A, F, G, MO, NY, S, U, UC, US).

Vines, high climbing lianas; stems pilose. *Leaves* with leaflets broadly elliptic to obovate, to 18 × 11 cm, the apex acuminate, ca. 15 mm long, sparsely appressed strigose above and beneath, chartaceous, slightly cordate truncate to rounded at the base, the lateral veins oblique, primary lateral veins 10–12 pairs; petioles canaliculate, strigose-pilose, the rachis to ca. 5 cm long, stipels ca. 7 mm long; stipules lanceolate, to 14 mm long, produced for ca. 6 mm below insertion, pubescent without. *Inflorescences* stout, 15–40 cm long, flowering ⅔ the length, the tubercles subsessile to clavate; bracts linear, usually emerging from the tubercles, occasionally persistent, erect, ca. 6 mm long, fuscous ferruginous pubescent; bracteoles broadly ovate or flabellate, 2 × 2–3 mm, fuscous ferruginous without, persistent; pedicels ca. 9 mm long. *Flowers* ca. 2 cm long; calyx tube yellowish, 7–10 mm long, carnose with sparse fuscous ferruginous pubescence without, velutinous within, the upper lobes partially fused, emarginate ca. 5 mm long, 8 mm wide, the lateral lobes slightly falcate, lanceolate, ca. 6 mm long, the lower lobe broadly lanceolate, ca. 9 mm long; standard broadly obovate rotund, carnose, glabrous, bicallose, to ca. 16 × 17 mm, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong ovate, ca. 16 mm long, ca. 8 mm wide, the claw ca. 5 mm long, the keels triangulate, ca. 8 mm long, ca. 11 mm wide distally, the auricle inconspicuous, the claw ca. 4 mm long, the upper margin usually with 1 prominent lobe, the beak narrow or hooded; staminal sheath sub-sigmatoidal, the anthers dimorphic, perfect anthers ca. 1 mm long, the middle anther frequently 1.5 mm long; ovary short stipitate, densely argenteous fuscous villous, (2–)5(–6)-ovulate, the upper style glabrous, ca. 5 mm long. *Fruits* green, fleshy, cylindrical oblong, ca. 15 × 5 × 4 cm, ?indehiscent, fuscous or ferruginous velutinous, the upper and lower suture inconspicuous;

seeds 2–4, cuboidal, 3.5 × 3.5 × 2.5 cm, soft, light brown, maculate, the hilum encircling nearly ½ the testa.

This species and the next are members of the *Dioclea* series with fleshy fruits. This species in Panama is considered conspecific with *D. pulchra* of the Colombian Andes flora rather than *D. malacocarpa* Ducke of the Amazonian flora. These two species are so close I had, at one time, considered *D. pulchra* a variety, but since then it has become apparent there are several fleshy fruited species that have evolved down the Andean chain as well as extending into Central America.

A common name "Mandeva" is reported from Darién (*Kirkbride & Duke 1140*). The fleshy fruits with soft seeds, small bracts, thin leaflets with a high number of primary lateral veins, and keel petals frequently with hooded beaks separate this and the following species from other high, climbing, forest lianas in *Dioclea*.

WITHOUT LOCALITY: *Carleton 259* (US). BOCAS DEL TORO: Changuinola Valley, *Dunlap 101* (F). Río Changuinola, *Dwyer* (MO). Almirante, *McDaniel 5110* (MO). Changuinola, island potrero, *Stork*, 1923 (UC); *Stork C78* (UC, US). Water Valley, *Wedel 786* (MO). Chiriquí Lagoon, *Wedel 2670* (GH, MO, US). DARIÉN: La Boca de Pirre, *Bristan 1274* (NY). Río Tuira, between Río Punusa & Río Mangle, *Duke 14590* (MO, NY). El Real, Río Cuasí S of Tres Bocas, *Kirkbride & Duke 1140* (MO). El Real, Río Tuira, *Stern et al. 121* (MO, US).

6. **Dioclea reflexa** Hook. f., Niger Fl. 306. 1849. TYPE: W. Africa, Cape Palmas and region of Fernando Poo, *Vogel 32* (K, holotype).

Canavalia reflexa (Hook. f.) Wright, Sauv. Cub. 535. 1869. Fide Sauer, Brittonia 16(2): 179. 1964.
Dioclea panamensis Seemann in Hemsley, Biol. Centr. Amer. Bot. 1: 302. 1880, nomen nudum. Based on *Fendler 83* (GH, K, MO, US) & *Seemann 455* (BM), non Duchass. & Walpers (1853).

Coarse *vines*; stems glabrate to fuscous pilose. *Leaves* with leaflets broadly elliptic to obovate, 5–23 cm long, 3–13 cm wide, the apex acute or shortly acuminate, usually glabrous except the primary veins, reticulate above, sparsely pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 8 pairs; petioles pilose, the rachis 2–3 cm long, the stipels filamentous, 3–14 mm long; stipules lanceolate, to ca. 22 mm long, produced to ca. 10 mm below insertion, pilose without. *Inflorescences* stout, to ca. 45 cm long, flowering ½ the length, the tubercles clavate, the head elongation variable, the indumentum usually fuscous ferruginous, occasionally the buds nigrescent; bracts lanceolate, 10–20 mm long, ca. 3 mm wide, occasionally persistent, reflexed, with appressed aureus-cinereous pubescence; bracteoles flabellate, 2–3 × 2–4 mm, fuscous puberulent without, persistent; pedicels 3–6 mm long. *Flowers* with straight buds, ca. 1.5–2.0 cm long; calyx tube ca. 7 mm long, carnose, fuscous ferruginous pubescent without, fuscous velutinous within, the upper calyx lobes partially fused, emarginate, 2–5 mm long, ca. 7 mm wide, the laterals acute, ca. 5 mm long, the lower acute, ca. 6 mm long; standard rotund orbicular to obovate, carnose, glabrous, bicallose, ca. 15 mm long, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong to obovate, ca. 10 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 9 mm long, ca. 10 mm wide distally, weakly auriculate, the claw ca. 5 mm long, the upper margin undulate or with 1 prominent lobe, culminating in an obtuse beak; stamens 10,

the vexillary and inner, alternate anthers of the staminal sheath imperfect, the perfect anthers ca. 1 mm long; ovary shortly stipitate, argenteous villous, 2–4 (–5)-ovulate, the upper style glabrous, ca. 6 mm long, the lower part bulbous. *Fruits* compressed, elliptic oblong, to ca. 17 × 5.5 × 2.4 cm, dehiscent, the pedicel attached medially, somewhat convex above, naviculate below, glabrate, the upper suture paralleled by thin wings, the lower margin swollen, sulcate; seeds (1–)2–4, semi-orbicular to oblong, ca. 30 × 25 × 14 mm, hard, dark brown, frequently maculate, the hilum encircling ca. ¾ the testa.

Dioclea reflexa is distributed pantropically. This is due to a flotation adaptation of the seeds which are occasionally found in the drift. These seeds however, cannot be distinguished from those of *D. wilsonii* and possibly other species, such as *D. javanica* Benth. of Asia.

Dioclea reflexa is difficult to distinguish from *D. wilsonii* and there may be some gene exchange. In general *D. reflexa* would be found at low altitudes, but not in the drift flora. Its indumentum ranges from light fulvous to ferruginous, but never as dark as *D. wilsonii*. The reflexed bract attitude, upon which the epithet is based, is a conservative character, but the width and indumentum are variable. The tendency for bracts and bracteoles to persist is also variable. The lower margin of *D. reflexa* fruits becomes sulcate and partially opens, but not enough to allow the seeds to disperse. This character can be seen in most Panamanian material, but may not hold world wide. The finally glabrous exocarp of *D. reflexa* is smooth, somewhat thicker than that of *D. wilsonii* and is frequently constricted somewhat between the seeds and also along the lower margin. The pedicel attachment of *D. wilsonii* is invariably at the upper margin, which is straight, while that of *D. reflexa* is variable, and fruits with a median attachment may be obovate in shape.

For flower color, seasonal aspects and other field characters of *D. reflexa*, *D. wilsonii* (as *D. violacea*) and *D. megacarpa*, see Johnston (1949). Johnston, I. M. 1949. The Botany of San Jose Island. Sargentia 8: 150–153, Plate 8, Fig. 4–5. Ducke, A. 1925. Arch. Jard. Bot. Rio de Janeiro 4: 97, *tab. 4*, *D. violacea* fide Ducke = *D. wilsonii*.

WITHOUT LOCALITY: *Seemann* (GOET). BOCAS DEL TORO: Chiriquí Lagoon, Johns Creek, *Wedel 2760* (GH, MO); CANAL ZONE: Barro Colorado Island: *Croat 5017* (MO, US), *5062, 7387, 8110, 8390, 12762, 13118, 14884* (all MO); *Wetmore & Abbe 64* (MO). Skunk Hollow, *Blum & Dwyer 2109* (MO). Westerly arm of Quebrada Salamanca, *Dodge et al. 16995* (BR, G, GH, MO, S). Skunk Hollow, *Dwyer 5435* (FSU, MO, SIU). Fort Sherman, *Dwyer 6621* (MO). France Field, U.S. Mine Emplacement Center, *Dwyer 8539* (MO). Chagres, *Fendler 83* (GH, MO, US). Near Gatún, *Gaillard* 1911 (US). Río Pequení, *Seemann 455* (BM). CHIRIQUÍ: Burica Peninsula, Guanabano, *Croat 22526* (MO). COLÓN: near Salamanca, *Gentry 6702* (MO). Between Río Piedras & Puerto Pilón, *Lewis et al. 3221* (MO). DARIÉN: Río Chunaque between Yaviza & junction with the Tuira, *Gentry 13484* (MO). PANAMÁ: San José Island, *Johnston 615, 653, 711* (all GH), *1207* (GH, S), *1254* (GH); *Kennedy 2275* (MO). Drowned forest of Quebrada Ancha, *Steyermark & Allen*, 21 Dec 1934 (MO). SAN BLAS: Ailigandí, *Dwyer 6832* (MO, SIU).

7. **Dioclea virgata** (L. C. Rich.) Amshoff, Meded. Bot. Mus. Herb. Rijks. Univ. Utrecht 52: 59. 1939.

Dolichos virgatus L. C. Rich., Act. Soc. Hist. Nat. Paris 1: 111. 1792. TYPE: French Guiana, not seen.

Mucuna virgata Desv., Ann. Sci. Nat. (Desvaux) 1: 423. 1826. TYPE: French Guiana, *L. C. Richard*(?) herb. *Desvaux* (P).
Dioclea lasiocarpa Mart. ex Benth., Comm. Legum. Gen. (Ann. Wiener Mus. Naturgesch. 2: 133. 1839) 69. 1837. TYPES: Brazil: Minas Gerais, *Pohl 3222* (W); Pará, *Martius* (BR, M); Bahia, *Martius 2016* (M).

Vines of open areas and forest edges; stems with canescent ferruginous pubescence. *Leaves* with leaflets broadly lanceolate, ovate to narrowly obovate, 7–10 × 4–6 cm, the apex acute, usually glabrescent above with variable pubescence below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 6 pairs; petioles 4–6 cm long, the rachis 4(–10) mm long, densely puberulent to strigose; stipels to 2 mm long; stipules triangulate, ca. 3 mm long, not produced. *Inflorescences* slender, to ca. 70 cm long, flowering about ½ the length, the tubercles subsessile to elongate, inflorescence indumentum canescent subtomentose to glabrescent; bracts triangulate rhombic, ca. 3 × 2 mm, persistent; bracteoles sub-orbicular, 6–10 × 4–6 mm, caducous; pedicels (5–)7(–15) mm long. *Flowers* ca. 2.5 cm long, the calyx tube ca. 8 mm long, membranous, glabrous without, canescent velutinous within, the upper calyx teeth fused, entire, the upper lobe acute obtuse, ca. 8 mm long, the lateral lobes falcate, broadly lanceolate, ca. 6 mm long, the lower lobe lanceolate, ca. 8 mm long; standard orbicular obovate, to ca. 25 mm long, membranous, puberulent apically, bicallose, biauriculate, the claw 7 mm long, the wings obliquely obovate, to 22 mm long, usually spurred, the claw 7 mm long, the keel obliquely oblong to nearly oblong, to ca. 20 mm long, ca. 10 mm wide distally, weakly auriculate, the claw ca. 5 mm long, the upper margin with 7–10 medial fimbriae, ca. 2 mm long; stamens 10, glabrous, anthers uniform; ovary ca. 11-ovulate, canescent velutinous, the style glabrous distally for ca. 7 mm. *Fruits* flat, oblong, usually obtuse basally, straight above, naviculate below, frequently with a falcate apex, to ca. 11.0 × 2.0 × 0.4 cm, dehiscent, with erect, stiff, ferruginous pubescence, the upper suture paralleled by thin wings, the lower swollen; seeds 7–12, flat, elliptic oblong, ca. 10 × 6 × 2 mm, hard, reddish brown, frequently maculate, the hilum encircling nearly ½ the testa.

This species is widespread throughout tropical South America and extends through Central America into Mexico.

The sub-orbicular, caducous bracteoles, glabrous calyx and fimbriate upper keel margin are characters which readily separate *D. virgata* from the closely related *D. guianensis* with its forms and varieties.

CANAL ZONE: Pipeline road, *Croat 12371* (MO); *Gentry & Dressler 1974* (MO). DARIÉN: Near Piñas, *Duke 10618* (MO). Río Aretí, *Duke & Nickerson 14907* (MO). PANAMÁ: El Llano-Cartí Road, 5 km from Panamerican Highway, *Witherspoon 8720* (MO).

8. **Dioclea wilsonii** Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 310. 1929. TYPE: Honduras, Point Triunfo, near Tela, *P. Wilson 336* (F).

D. violacea sensu Mart. Fl. Bras. 15(1): 162. 1859 (based on collections such as *Guillemin* (K)); non *D. violacea* Mart. ex Benth. (1837), based on *Pohl 338* (W lectotype) and *Martius* (BR paratype).
D. altissima Rock, Leg. Pl. Hawaii 201, *tab. 83.* 1920, non Velloso, Fl. Flum. 296. 1825; Icon. 7: *tab. 77.* 1831.
D. violacea auct. mult., non Benth. 1837.

Coarse *vines*; stems glabrescent to densely ferruginous pilose. *Leaves* with leaflets broadly elliptic to obovate, 7–16 cm long, 4–11 cm wide, the apex abruptly acute, usually glabrous except the primary veins, reticulate above, sparsely pubescent below, chartaceous, obtuse at the base, the laterals oblique, primary lateral veins in ca. 7 pairs; petioles sparsely strigose to pilose, the rachis 2–3 cm long, stipels to 15 mm long; stipules lanceolate, 15–30 mm long, produced to ca. 10 mm below insertion, pilose and ciliate without. *Inflorescences* to 45 cm long, flowering more than ½ the length, the tubercles clavate, the head elongation variable, the inflorescence indumentum ferruginous nigrescent; bracts linear, erect, ca. 8 mm long or longer, caducous; bracteoles broadly ovate to flabellate, 2–3 × 4 mm, caducous; pedicels 2–6 mm long. *Flowers* with straight buds, ca. 1.5 cm long, calyx tube ca. 7 mm long, carnose, ferruginous-nigrescent pubescent without and within, the upper calyx lobes partially fused, emarginate, ca. 5 mm long, ca. 9 mm wide, the laterals acute, ca. 6 mm long, the lower acute, ca. 7 mm long; standard rotund orbicular, carnose, glabrous, bicallose, to 15 mm long, the auricles semi-orbicular, reflexed, the claw ca. 3 mm long, the wings obliquely oblong to obovate, to ca. 15 mm long, the claw ca. 5 mm long, the keel triangulate, ca. 8 mm long, ca. 9 mm wide distally, auriculate, the claw ca. 5 mm long, the upper margin undulate, culminating in an obtuse beak; stamens 10, the anthers dimorphic, the vexillary anther and the inner, alternate anthers of the staminal sheath imperfect, perfect anthers ca. 1 mm long; ovary stipitate, argenteous villous or bicolored, 3–4-ovulate, the upper style glabrous, ca. 5 mm long, the lower part bulbous. *Fruits* compressed, oblong, to ca. 10 × 6 × 1–2 cm, pedicel attached along the upper suture, straight above, naviculate below, indehiscent, glabrate, the upper suture paralleled by thin wings, the lower margin thin; seeds 2–4(–5), semi-orbicular to oblong, ca. 30 × 25 × 15 mm, hard, dark brown, the hilum encircling ca. ¾ of testa.

In trying to match fruits with flowers, Bentham mixed fruits of *Dioclea wilsonii* with flowers of *D. violacea* in his *D. violacea* description in *Flora Brasiliensis*. The taxonomy was confused apparently until Standley named *D. wilsonii*. At least this was the opinion of the late C. V. Morton of the U.S. National Herbarium when I discussed the nomenclatural problem with him. *Dioclea violacea*, on the basis of the syntypes Bentham used in his original description, is the same as *D. paraguariensis* Hassler and very closely related to *D. megacarpa*.

Dioclea violacea is about as closely related to *D. megacarpa* as *D. wilsonii* is to *D. reflexa*, but the latter are sympatric while the former are apparently not. *Dioclea wilsonii* is found in eastern Brazil, throughout northern South America, in some of the West Indies and throughout Central America into Mexico. It is also found in the Hawaiian Islands and some of the Pacific Islands and I have annotated collections from the Malagasy Republic (Madagascar) as *D. wilsonii* (as possible introductions?), but Madagascar plants may prove not to be the same species.

It is generally assumed that *D. wilsonii* seeds are distributed as part of the oceanic drift as are *D. reflexa* seeds from which they cannot be distinguished. Actually collections show *D. reflexa* to be more widely distributed and that much of the *D. wilsonii* distribution could be due to man rather than drift.

This species can be separated from the closely related *D. reflexa* in possessing a very dark inflorescence indumentum, erect bracts, and an indehiscent fruit.

BOCAS DEL TORO: Water Valley, *Wedel 861* (GH, MO, US). Chiriquí Lagoon, *Wedel 1054, 1155* (both GH, MO), *1688* (GH, MO, US), *2147, 2728* (both MO). CANAL ZONE: Barro Colorado Island, *Bangham 568* (A, F, US); *Croat 5279, 6726, 6862* (all MO); *Foster 980* (MO), *1334* (F, MO), *1425* (MO); *Shattuck 441* (F, US); *Standley 40992a* (US, fruit only). COLÓN: between France Field and Cativa1, *Standley 30390* (US). HERRERA: near Las Minas, along Río Las Trancas, *Stern et al. 1802* (MO, US). PANAMÁ: Empire Station, *Hayes 313* (BM, K). San José Island, *Johnston 418* (BM, GH, MO, P, U, US), *612* (GH), *1170* (BM, GH).

20. DIPHYSA

Peter S. White[50]

Diphysa Jacq., Enum. Syst. Pl. Carib. 7. 1760. TYPE: *D. carthagenensis* Jacq.

Trees or *shrubs*, unarmed or with spinescent branches; branchlets, pedicels, and/or calyx glandular viscid in some species. *Leaves* alternate, imparipinnate, petioled; lateral leaflets opposite, subopposite, or alternate, entire, short petioluled; stipels absent; stipules small, caducous. *Inflorescence* of short axillary racemes or fascicles; pedicels solitary at the nodes, jointed below the calyx, each 2-bracteolate. *Flowers* yellow; hypanthium campanulate, the 5 lobes unequal, the 2 uppermost lobes relatively broad, the 2 lateral lobes equal to these in length but narrower, the lowest lobe narrow, acute, longer than the others; petals yellow, unequal, the standard the longest, the keel petals the shortest, all petals short clawed; the standard reflexed with 2 basal callosites inside, the wing and the keel petals often auriculate; stamens diadelphous, the odd stamen free, the anthers uniform; ovary stipitate, the style glabrous, the stigma small, terminal, ovules many. *Fruit* distinctively inflated, stipitate, oblong, the pericarp splitting into 2 layers, a papery inflated exocarp and a firm endocarp, the legume thus with a bladder on each side; seeds oblong, compressed, attached near one end.

Diphysa is a genus of some 15–18 named species of which perhaps only ½ will prove to be distinct (Standley & Steyermark, 1946). The species are found from Mexico, where the number of species is greatest, south through Central America to northern South America. *Diphysa* is readily recognized by its papery, reticulately veined, inflated exocarp, which gives the fruit a bladdery appearance.

1. **Diphysa robinioides** Benth. in Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 11. 1854. TYPE Nicaragua, not seen.—FIG. 23.

D. carthagenensis sensu Benth. & Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853: 13. 1854. not *D. carthagenensis* Jacq., Enum. Syst. Pl. Carib. 28. 1760; Sel. Stirp. Amer. 208. *tab. 181. fig. 51.* 1763.

Medium-sized *tree*, usually 5–9(–23) m tall, branchlets usually glabrous or sparsely pubescent. *Leaves* alternate, imparipinnate, to 16 cm long; leaflets

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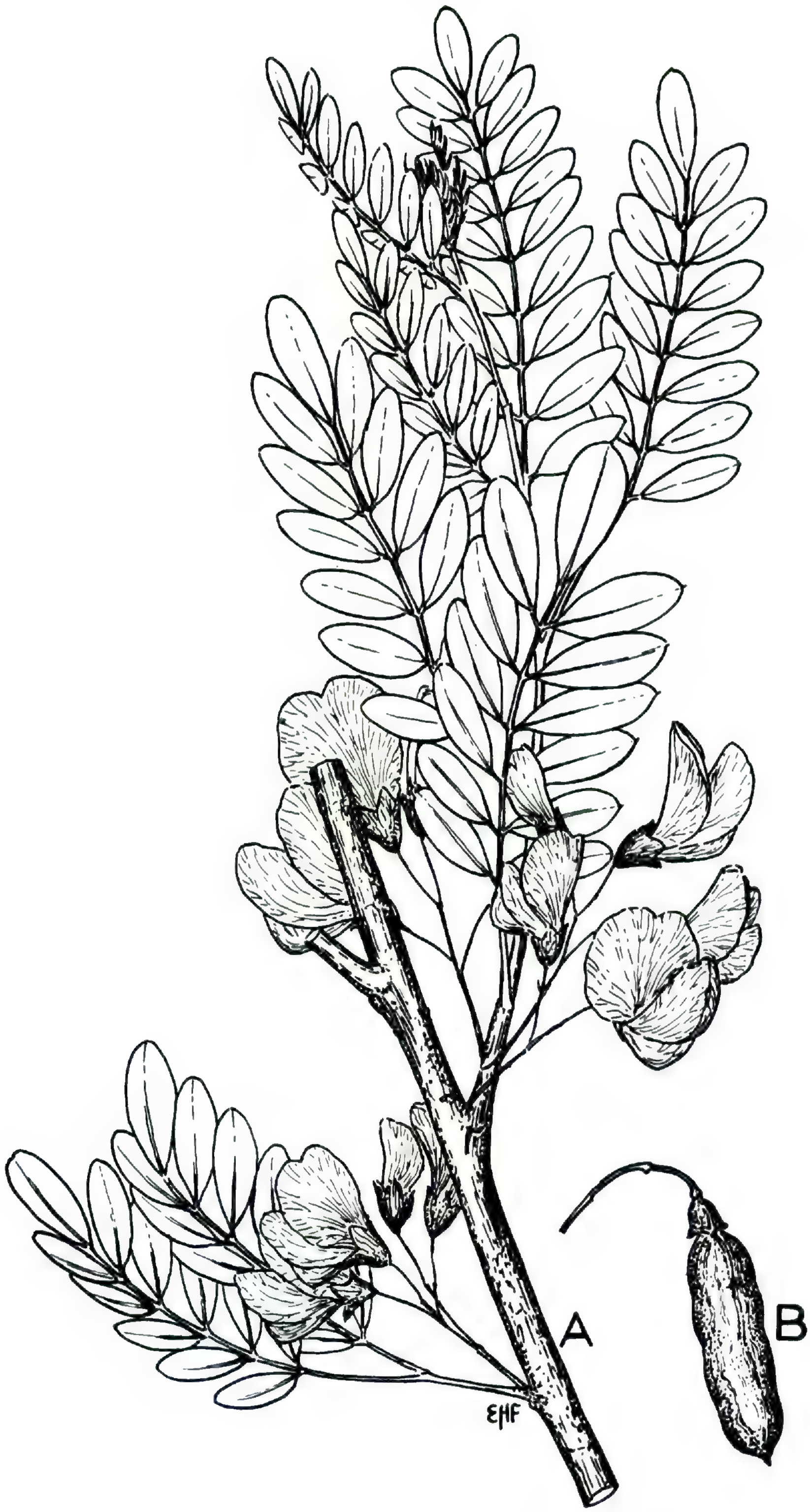

FIGURE 23. *Diphysa robinioides* Benth.—A. Habit (×1).—B. Fruit (×1).

(5–)9–15(–21), the lateral leaflets opposite or subopposite, oval or obovate, usually 1.5–3.5 cm long, 0.5–1.0 cm wide, unequal, even on the same specimen, distal leaflets often larger, rounded or retuse at the apex, glabrous and paler beneath, short-petioluled; petioles 1–3 cm long; stipules 2–4 mm long, caducous. *Inflorescence* of short axillary racemes, 4–7 cm long, 3–6-flowered, appearing with new growth at the end of dry season, pedicels 4–6 mm long. *Flowers* bright yellow, to 2 cm long; hypanthium funnel shaped, 6–9 mm long, glabrous, the upper teeth partly united, broader than others, the lateral and lowest tooth triangular, the lowest tooth slender; standard circular, to 20 mm long, the claw ca. 4 mm long, the wings free, obovate to oblong, auriculate, the keel with basal auricles prominent; stamens diadelphous; ovary with stipe ca. 4 mm long. *Fruit* a legume with exocarp on either side thin, inflated, conspicuously reticulate veined, (4–)6–11 cm long, 1.5–2.0 cm wide, glabrous; fruiting pedicels 1.5–2.0 cm long, stipe 5–8 mm long; seeds light brown, ca. 6 mm long, ca. 3 mm wide.

Diphysa robinioides is found from southern Mexico to Panama. It is apparently a common tree in parts of Panama, including the Canal Zone (Standley, 1928). Common names in Panama include "macano" and "cacique." It is used as a living fence post.

Jacquin (1763) was in error when he cited his plate CLXXX; no figure 51 appears in that plate, but does appear on the next page, plate CLXXXI and the species figured is *Diphysa carthagenensis*. Most references cite 180, but 181 appears to be correct.

Diphysa robinioides is somewhat variable in leaflet size (usually longer than 15 mm, rarely shorter), leaflet texture (usually thin, rarely thick), whether the leaflet apex is rounded or retuse, pubescence (usually none or sparse), and length of legume (usually 6–11 cm long). Collections of flowering specimens have young leaves only. These are, of course, smaller, thus somewhat confusing the situation. Young fruits which may look mature are shorter than fully mature fruits, also complicating the situation. *Diphysa robinioides* is apparently closely related to *D. carthagenensis* Jacq. The latter species is distinguished by its smaller leaflets (7–15 mm long), shorter corolla (ca. 10 mm long), and shorter legume (ca. 4 cm long). *Diphysa carthagenensis*, like *D. robinioides*, is usually glabrous. *Diphysa carthagenensis* has been found in Colombia, Venezuela, Guatemala, and Mexico, and is therefore to be looked for in Panama.

Diphysa floribunda Rose is also similar to *D. robinioides*. It has the large leaflets, corolla, and legume of that species but it is densely pubescent on branches and peduncles. The leaves are also pubescent, at least when young. *Diphysa floribunda* has been found in Mexico and Guatemala. It may represent a variety of *D. robinioides* (Standley & Steyermark, 1946). *Duke 9317* from Río Ailigandi, San Blas, has the short (4 cm) legumes of *D. carthagenensis* but is leafless. Further collections are necessary for satisfactory determination. *Lewis et al. 181*, also collected along the Río Ailigandi, is clearly *D. robinioides*.

WITHOUT LOCALITY: *Seemann 202* (US). CANAL ZONE: Pacific Saddle Club area, *Blum 2055* (FSU, GH, MO, SCZ). Pacora Road, *Correa & Dressler 444* (GH, MO). Gaillard Highway near Paraiso, *Croat 13174* (DUKE, F, MO, NY, SCZ). Near Paraiso, *Croat 13254* (DUKE, F, MO, SCZ). Cerro Galera, 350–400 m, *Gentry 6608* (MO). Summit, *Johansen s.n.* (NY). Gatuncillo, *Piper 5119* (US). Balboa, *Standley 27129* (GH, US). Paraiso, *Tyson 7401* (MO). CHIRIQUÍ: San Lorenzo, *Godfrey*

67334 (FSU, MO). San Félix, 0–120 m, *Pittier 5234* (NY, US). Comarca del Barú, *Stern & Chambers* 134 (US). 3 mi S of El Volcán, 4000 ft, *Tyson 886* (FSU, MO). COCLÉ: S rim of El Valle de Antón, 800 m, *Allen 2283* (F, GH, MO, NY, US). El Valle de Antón, *Folsom & Kauke 2766* (MO). 1 mi from El Valle, *Garner 32* (FSU, SCZ). Capellanía, *Gonzalez 4* (DUKE, MO). El Valle, *White & White 67* (MO, US). Penonomé, *Williams 122* (NY, US). DARIÉN: Jeniné, *Duke 3486* (MO). HERRERA: Chitré, 20 m, *Allen 1096* (GH, MO, US). Ocú, 100 m, *Allen 4074* (MO). Road from Ocú to Chupampa, *Graham 224* (GH). Ocú, *Stern et al. 1742* (MO, US). 4 mi S of Los Pozos, *Tyson 2694* (FSU). LOS SANTOS: 7 mi S of Las Tablas, *D'Arcy 4205* (MO). 1–2 mi W of Candelaria, *Duke 12432* (MO, NY). Las Tablas, *Dwyer 1146* (NY), *2494* (US). Road from Macaracas to Chitré Highway, *Tyson et al. 3149* (FSU, MO, SCZ). PANAMÁ: Pacora Road, *Correa & Dressler 444* (SCZ, US). Chepo, *Gentry & Tyson 1728* (F, FSU, MO, SCZ). Near Panama City, *Hunter* (GH, MO). Ancón Hill, *Hunter* (MO). Chepo, *Kluge 28* (US). Cerro Azul, 600 m, *Lao & Holdridge 39* (DUKE). Bellevista, *MacBride 2751* (F, US). Sabanas, *Paul 169* (US). Sabana de Juan Corso, *Pittier 4641* (US). Corozal Road, *Standley 26822* (US). Between Las Sabanas and Matías Hernández, *Standley 31826* (GH, US). W of Chepo, *Tyson 5371* (FSU, MO, SCZ). Cerro Azul above lake, *Tyson & Lazor 6087* (FSU). SAN BLAS: Lower Río Ailigandí, *Duke 9317* (MO). Ailigandí river bank, *Lewis et al. 181* (GH, MO, US). VERAGUAS: E of Santiago, 30 m, *Duke 12351* (MO). Between Quebrada El Nance and Santa Fé, 250 m, *Nee 8146* (MO). Between San Francisco and Santa Fé, *Stern et al. 1919* (MO, US). El Embalsadero, *Tyson 6091* (SCZ).

21. DUSSIA

Michael O. Dillon[51]

Dussia Krug & Urban ex Taubert, Naturl. Pflanzenfam. 3, Abt. 3: 193. 1892. TYPE: *Dussia martinicensis* Krug & Urban ex Taubert.

Vexillifera Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 139. 1922. TYPE: *Vexillifera micranthera* Ducke = *Dussia discolor* (Benth.) Amsh.

Cashalia Standley, J. Wash. Acad. Sci. 13: 440. 1923. TYPE: *Cashalia cuscatlanica* Standley = *Dussia cuscatlanica* (Standley) Standley & Steyermark.

Trees, to 50 m high, to 1 m in diameter, the trunk straight, high crowned, the bases buttressed, the bark smooth, gray, sap blood red; stems terete, striate or slightly angular, puberulent to tomentose, glabrate. *Leaves* imparipinnate, 5–25-foliolate, the leaflets alternate to subopposite, exstipellate; stipules minute, caducous. *Inflorescence* axillary, racemose or racemose paniculate. *Flowers* rarely andromonoecious, pink to purple, 15–25 mm long; calyx campanulate, somewhat oblique, the 5 lobes subequal; standard orbicular reniform, persistent; wing straight, the keel petals similar to wings, dorsally tomentose; stamens 10, subequal, the filaments connate at the base, 1 subfree, the anthers dorsifixed, versatile, ovate; ovary 1–5-ovulate, pubescent, brevistipitate or subsessile, the style pubescent, incurved, the stigma apical, minute. *Fruit* narrowly ovoid ellipsoid to obovoid, compressed laterally, 2-valved, dehiscent, orange velutinous, commonly 1–2-seeded; seeds red, ellipsoid or cylindrical, the hilum small, linear, lateral; cotyledons thick and fleshy, radicle short, inflexed.

Dussia is an American tropical rain forest element represented by ten species, principally from the Antilles and southern Mexico southward to central Peru and the Amazon basin of Brazil. Each species is essentially endemic, occupying small geographic range and usually quite rare within a community. Since all species are large, buttressed trees, adequate collections are difficult to obtain, and flowering

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or fruiting material is often lacking. Two apparently rare species are found in Panama, each used locally as a lumber source.

Literature:

Rudd, V. E. 1963. The genus *Dussia* (Leguminosae). Contr. U.S. Natl. Herb. 32(4): 247–277.

a. Leaves 11–25-foliolate, the leaflets predominately oblong to obovate, 7–15 cm long, 2.5–9.0 cm wide, the lower surface villous with subpatent or sometimes crisp pubescent; bracts larger than bracteoles, 5–10 mm long, 2–4 mm wide, the bracteoles 5–7 mm long, 2–3 mm wide ---------- 1. *D. cuscatlanica*

aa. Leaves 5–9-foliolate, the leaflets predominantely elliptic to ovate or obovate, 9–15 cm long, 6–9 cm wide, the lower surface crisp pubescent; bracts smaller than bracteoles, 7–10 mm long, 4–7 mm wide, the bracteoles 9–12 mm long, 8–9 mm wide ------ 2. *D. macroprophyllata*

1. **Dussia cuscatlanica** (Standley) Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 341. 1940.—FIG. 24.

Cashalia cuscatlanica Standley, J. Wash. Acad. Sci. 13: 441. 1923. TYPE: El Salvador, Finca Colima, Sierra de Apaneca, Ahuachapan, *Standley 20197* (F, holotype; GH, isotype).

Dussia grandifrons Johnst., J. Arnold Arbor. 19: 118. 1938. TYPE: Guatemala, Quezaltenango, *Skutch 2027* (A, holotype).

Tree to ca. 50 m tall; young stems yellowish to reddish pubescent, patent to crispate, glabrate. *Leaves* 11–25-foliolate; the petioles ca. 9 cm long, the rachises 20–40 cm long; petiolules 4–10 mm long; leaflets 5–11 cm long, 3–6 cm wide, the lower leaflets more oval to ovate, terminal leaflet usually obovate, others usually oblong, the apex acuminate to acute, the base obtuse, truncate or subcordate, the upper surface glabrous, the lower moderately pubescent with patent to slightly crispate trichomes. *Inflorescence* racemose, yellowish to reddish tomentose; bracts tridentate to rhombic or lanceolate, erose to entire, acuminate, 5–10 mm long, 2–4 mm wide, bracteoles obovate, entire or dentate, acuminate, 5–7 mm long, 2–3 mm wide. *Flowers* (15–)18–25 mm long; calyx 8–10 mm long, the lobes 4–5 mm long; corolla pale pink with a greenish streak along the standard. *Fruit* 5–10 cm long, 2.5–3.5 cm wide, dehiscent, the valves curling; seeds 2.0–3.5 cm long, 1.3–1.7 cm in diameter.

This species is found infrequently in forests from southern Mexico to Panama. It is distinguished from the following species in having more leaflets, flowers with the bracteoles smaller than the bracts, and usually larger 2-seeded fruits. It is known by several local names, "matabuey" (Mexico), "cashal" (El Salvador), "palo de tigre" (Guatemala), and "pizarro" (Panama).

CHIRIQUÍ: 8 km N of El Volcán, *Little 6048* (MO, US). DARIÉN: El Real, *Duke 2110* (MO, NY). Río Balsa between Manené and Tusijuanda, *Duke 13555* (MO, NY). Summit of Cerro Pirre, *Gentry & Clewell 7010* (MO).

2. **Dussia macroprophyllata** (Donnell Smith) Harms, Repert. Spec. Nov. Regni Veg. 24: 212. 1928.

Diplotropis macroprophyllata Donnell Smith, Bot. Gaz. 61: 56. 1913. TYPE: Costa Rica, Las Vueltas, Tucurrique, Cartago, *Tonduz 12949* (US, holotype).

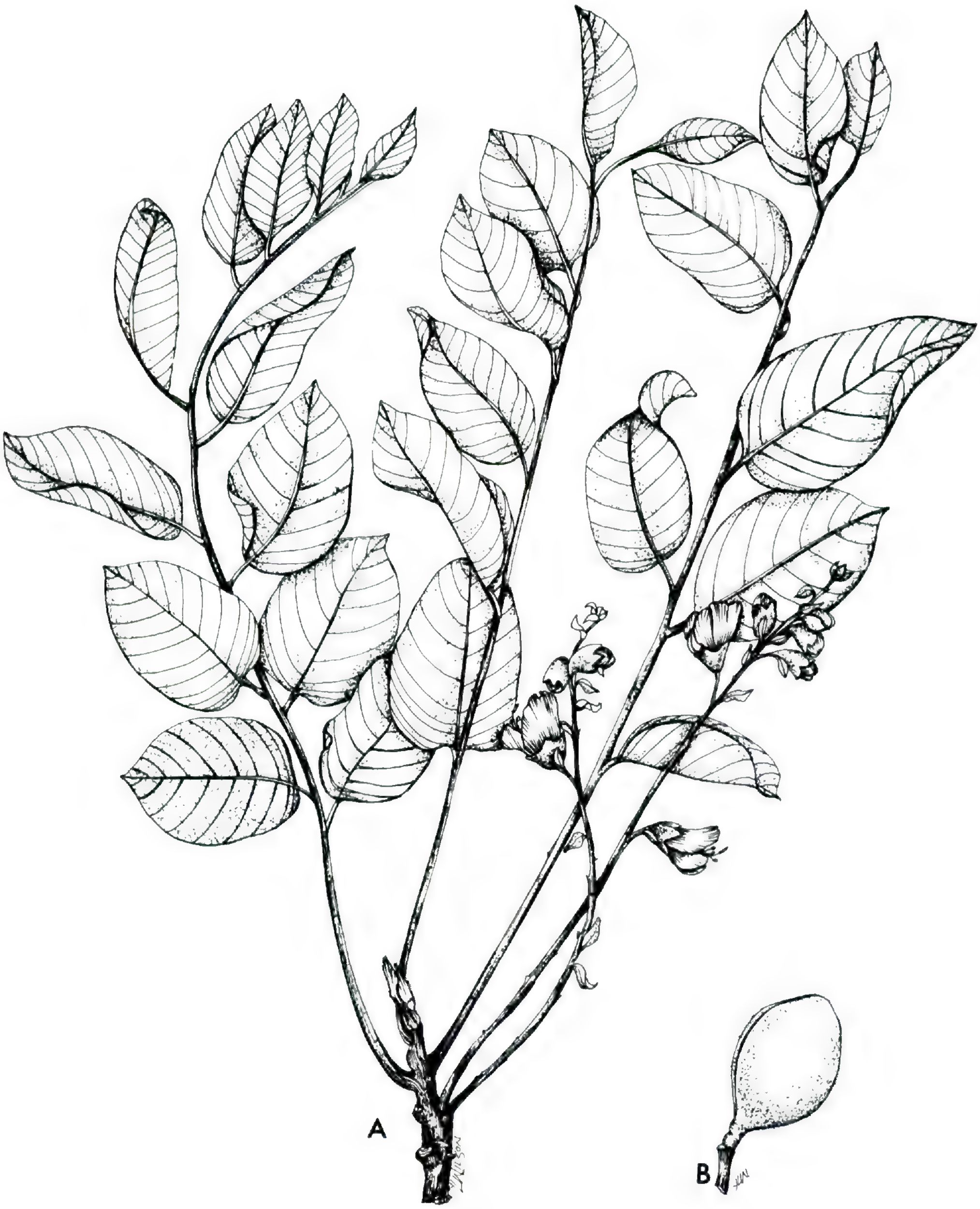

FIGURE 24. *Dussia cuscatlanica* (Standl.) Standl. & Steyerm.—A. Habit (×½). [After *Duke 8210.*]—B. Fruit (×½). [After *Duke 13555.*]

Cashalia panamensis Standley, Trop. Woods 16: 16. 1928, nomen nudum, Publ. Field Columbian Mus., Bot. Ser. 4: 212. 1929. TYPE: Panama, *Cooper 520* (F, holotype).

Tree to ca. 40 m tall; young stems yellowish to reddish tomentose. *Leaves* 7–9-foliolate, rarely 11-foliolate; leaflets 6–18 cm long, 4–9 cm wide, ovate, elliptic, elliptic oblong, or obovate, the apex obtuse or sometimes acuminate, densely crisp pubescent below, glabrous above. *Inflorescence* racemose, reddish tomen-

tose, the bracts clawed, rhomboid lanceolate, acuminate, 7–10 mm long, 4–7 mm wide, oblique, erose; bracteoles ovate, clawed, cordate, erose, 9–12 mm long, 8–9 mm wide, acute. *Flowers* 17–20 mm long; calyx ca. 10 mm long, the lobes ca. 5 mm long; corolla purplish. *Fruit* ca. 5 cm long, ca. 2.5 cm wide, 1-seeded.

Dussia macroprophyllata is better collected to the north in Costa Rica. It is distinguished by its large leaflets, relatively small fruits, and bracteoles that are larger than the bracts. It is known locally in Panama as "citron."

BOCAS DEL TORO: Almirante, *Cooper 520* (F). COLÓN: Ca. 7 km SW of Portobelo along Río Guanche, *Mori & Kallunki 5203* (MO).

22. ERIOSEMA

Muriel E. Poston[52]

Eriosema (DC.) G. Don, Gen. Hist. 2: 347. 1832. Nomen cons.

Rhynchosia sect. *Eriosema* DC., Prodr. 2: 388. 1825. TYPE: *Eriosema rufum* (H.B.K.) G. Don.
Euriosma Desv., Ann., Sci. Nat. I. 9(1): 421. 1826. Nomen rejic. TYPE: *E. sessiliflora* Desv.
Euryosma Walp., Rep. 1: 785. 1842. orth. mut. *Eriosema* (DC.) G. Don.

Perennial *herbs* or *subshrubs*; stems angular to terete, striate, pubescent. *Leaves* trifoliolate or rarely unifoliate; leaflets gland-dotted below; stipules lanceolate or oblong, usually persistent. *Inflorescence* axillary or terminal, racemose, the flowers sometimes congested at the tips; bracts lanceolate, striate strigulose, caducous. *Flowers* with the calyx campanulate, the teeth 5, gland-dotted; corolla papilionaceous, the standard usually yellow with reddish purple to maroon striations, obovate with auriculate base, the wings narrowly oblong, lobed above the claw, the keel falcate; stamens 10, diadelphous, the vexillary stamen free, the anthers equal; ovary sessile or subsessile, villous, the style curved, slender, the stigma capitate. *Fruit* oblong, bivalved; seeds 2, ovoid, black, brown or mottled, the striophiole white, the hilum linear or oblong.

Eriosema is a pantropical genus of about 500 species with the greatest diversity in Africa. In the Americas 38 species are currently recognized (Grear, 1970). Although *Eriosema* has often been confused with *Rhynchosia* the two genera can be separated on the basis of habit, petiolar characters, arrangement of the calyx lobes, and characters of the hilum and the striophiole.

Literature:

Grear, J. W. 1970. A revision of the American species of *Eriosema* (Leguminosae-Lotoideae). Mem. New York Bot. Gard. 20(3): 1–98.

a. Leaves trifoliolate.
  b. Leaflets ca. 5 times long as wide, linear to lanceolate.
    c. Leaflets ciliate; inflorescence compact, few-flowered; calyx 2–7 mm long ..... 1. *E. crinitum*
    cc. Leaflets not ciliate pubescent; inflorescence a spiciform raceme, multiflorate; calyx 3–5 mm long ..... 4. *E. violaceum*

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bb. Leaflets less than 5 times long as wide, broadly lanceolate to lanceolate ---------- 2. *E. diffusum*

aa. Leaves unifoliolate ---------- 3. *E. simplicifolium*

1. **Eriosema crinitum** (H.B.K.) G. Don, Gen. Hist. 2: 348. 1832.

Glycine crinita H.B.K., Nov. Gen. Sp. Pl. 6: 421. 1823. TYPE: Venezuela, "montosis Novae Andalusiae, in Cerro del Cocollar," not seen.

Rhynchosia crinita (H.B.K.) DC., Prodr. 2: 389. 1925.

Eriosema pinetorum Standley, Field Mus. Nat. Hist., Bot. Ser. 8: 315. 1931. TYPE: British Honduras, not seen.

Herb to *subshrub*; stems erect to ascending from a thick rootstock, puberulent to externally pilose. *Leaves* trifoliolate, leaflets linear to lanceolate, apically mucronate to acute, basally cuneate, the margins ciliate, 4.2–7.2 cm long, 0.7–1.2 cm wide, strigose above, glabrous below, the terminal leaflet exceeding the lateral leaflets; petioles 0.1–0.4 cm long, pilose; stipules lanceolate, connate, strigose externally, 1.0–1.6 cm long, 0.1–0.2 cm wide. *Inflorescences* not exceeding the leaflets, few-flowered, the peduncle 0.4–1.0 cm long; pedicels 0.4–0.5 cm long; bracts subtending the inflorescence 1.5 cm long, 0.3 cm wide; subtending bracteoles caducous, 0.5–0.7 cm long, 0.1–0.2 mm wide. *Flowers* with the calyx 0.4–0.9 cm long, the lobes 0.2–0.7 cm long, the upper lobe the longest, strigose; corolla yellow, 1.0–1.5 cm long, the standard obovate, 1.0–1.3 cm long, 0.7–0.8 cm wide, auriculate at the base, the claw 1.0 mm long, the wings oblong 1.0–1.1 cm long, 0.3–0.4 cm wide at the largest point, the claw 0.3–0.4 cm long; stamens 0.8–1.1 mm long, the vexillary stamen free; ovary sericeous. *Fruit* ovate, 1.2–1.5 cm long, 0.5–0.7 cm wide, externally strigose; seeds ovoid, 2.0–4.0 mm long. 1.0–2.0 mm wide, black brown mottled.

Eriosema crinitum appears to have continuous variation throughout its range in Panama and is the most common *Eriosema* species occurring there. *Eriosema crinitum* occurs in savannas, campos, cerrados, usually in sandy soils, at 300–2700 m. Grear (1970) has described three varieties which he considers to have distinct morphological characters well correlated with geographical distribution. *Eriosema crinitum* var. *fusiformis* (Rusby) Grear is separated by its smaller stature and its whitish silky pubescence. *Eriosema crinitum* var. *macrophyllum* Grear is separated by its smaller fruits and more numerous flowers. Neither of the varieties has been reported from Panama or surrounding regions.

CANAL ZONE: Ancón Hill, *Piper 5552* (US); *Standley 25186* (US). CHIRIQUÍ: Boquete, *Allen 4712* (GH, MO); *D'Arcy 6313* (MO); *Davidson 760* (F, MO). Sabana de la Tortuga between Boquete and Caldera 300–700 m, *Pittier 3301* (US). Llanos del Volcán, 1120–1200 m, *Siebert 339* (MO). COCLÉ: Natá, 50 m, *Allen 829* (MO). Cerro Pilón, 2700 ft, *Dwyer 1051* (MO). Llanos outside Penonomé, *Ebinger 1030* (F, MO, NY). PANAMÁ: Hills above Campana, 600–800 m, *Allen 1312* (MO). Between Chepo and El Llano in burned area, *Croat 14491* (MO). Chepo, *Dodge 16690* (MO). Savanna near Río Pacora and Chepo highway, *Duke 5897* (MO). Cerro Campana, *Duke 6026* (MO); 2400–2700 m, *Duke 8679* (MO, OSU, US). Between Río Pacora and Chepo, *Dwyer et al. 5091* (MO). Cerro Campana, *Ebinger 912* (F, GH, MO). 69 km W of Panamá near Panamerican highway, *Folsom 4109* (MO). 7 mi W of Chepo, *Gentry & Tyson 1629* (MO, SCZ). Cerro Campana, *Lewis et al. 3149* (MO); *McDaniel 6820* (FSU); *Nee 6846* (MO). Las Sabanas, *Standley 25913* (US). W slope of Cerro Campana, 2500 ft, *Tyson et al. 2375* (FSU, NY, SCZ). Near Arraijan, *Woodson 1401* (GH, MO). VERAGUAS: San José, 18 km S of Santa Fé, 400 m, *Nee 8173* (MO).

2. **Eriosema diffusum** (H.B.K.) G. Don, Gen. Hist. 2: 347. 1832.—FIG. 25.

Glycine diffusa H.B.K., Nov. Gen. Sp. Pl. 6: 420. 1823. TYPE: Colombia, "prope fluvium Putes, prov. Popayanensium" not seen.
Rhynchosia diffusa (H.B.K.) DC., Prodr. 2: 388. 1825.
Rhynchosia diffusa var. *oblongifolia* DC., Prodr. 2: 388. 1825. TYPE: not seen.
Eriosema diffusa var. *oblongifolia* (DC.) G. Don, Gen. Hist. 2: 347. 1832.
Eriosema diffusa var. *holosericeum* Seem., Bot. Voy. Herald 110. 1853. TYPE: Panama, Volcano of Chiriqui, *Seemann*, not seen.

Erect *herb* or *subshrub*, the stems ascending from a woody base, terete, densely sericeous. *Leaves* trifoliolate, the leaflets oblanceolate to obovate, 2.5–4.7 cm long, 0.8–1.2 cm wide, apically acuminate, basally cuneate, the margins revolute, pubescence strigose above, tomentose silvery beneath, especially along the veins, the terminal leaflet longer than the laterals, the petioles 1.0–2.0 mm long, densely white sericeous; stipules lanceolate, connate to occasionally splitting, 0.6–1.0 cm long, 0.3–5.0 cm wide, externally strigose. *Inflorescence* 1.5–3.8 cm long, not exceeding the leaflets; flowers 5–10 per cluster; peduncles 1.8–3.0 mm long, 1.0–1.5 mm wide; pedicels 0.3–0.5 cm long; bracts subtending the flowers lanceolate, caducous, 2.0–4.0 mm long, 1.0–1.5 mm wide. *Flowers* with the calyx 3.0–4.0 mm long, the tube 1.0–1.5 mm long, externally pubescent, gland dotted; corolla yellow, 7.0–8.0 mm long, the standard ovate, 8.0–9.0 mm long, 4.0–4.5 mm wide, auriculate at the base, the wings oblong, 0.6–0.7 cm long, the claw 0.2 mm long, the keel falcate, 0.6–0.7 cm long, the stamens 0.7 cm long. *Fruit* ovate, 0.9–1.1 cm long, 0.5–0.7 cm wide, brown strigose; seeds ovoid, 3.0–3.3 mm long, 1.5–2.0 mm wide, black or mottled.

Eriosema diffusum ranges from Mexico to northern Colombia, occurring on savannas and grassy banks near streams. In Chiriqui, Panama, it occurs on lava fields. *Eriosema diffusum* is recognized by the silvery pubescence of the underside of the leaves. Seemann described *E. diffusum* var. *holosericeum* based on plants collected in Chiriqui, which have copious pubescence on both the upper and lower leaflet surface. However, this single character difference does not seem to warrant segregation of a variety (Grear, 1970).

CHIRIQUÍ: Near Volcán, 1300 m, *Burt & Koster 156* (MO). Boquete, 3800 ft, *Davidson 728* (GH, MO, US). Near Volcán, 4600 ft, *Duke 9181* (MO, OS), *9204* (NY, MO); *Ebinger 763* (MO). ½ mi S of Bambito on lava flow, 1600 m, *Lazor & Correa 2710* (FSU, MO, SCZ); *Partch 69-28* (MO). Forest near Boquete, 1000–1300 m, *Pittier 2945* (GH, MO, NY). Llanos del Volcán, 1120–1500 m *Siebert 340* (MO); *Tyson 5748* (FSU), *5858* (FSU, MO, SCZ). Río Chiriquí Viejo valley, *White 85* (GH, MO, US). Near El Hato del Volcán, *Wilbur et al. 17194* (MO), *11934* (F, MO, NY). PANAMÁ: Road between Panamá and Chepo, *Dodge 16634* (GH, MO). Pacora, *Paul 268* (US). Penonomé, 50–1000 ft, *Williams 582* (US, NY). VERAGUAS: 18 km S of Santa Fé on Santiago road, 400 m, *Nee 8173* (MO).

3. **Eriosema simplicifolium** (H.B.K.) G. Don, Gen. Hist. 2: 348. 1832.

Glycine simplicifolia H.B.K., Nov. Gen. Sp. Pl. 6: 419. 1823. TYPE: Venezuela, "prope Atures, ad cataractas Orinoci," not seen.
Rhynchosia simplicifolia (H.B.K.) DC., Prodr. 2: 389. 1825.
Eriosema lanceolatum Benth., Ann. Nat. Hist. 3: 438. 1839. British Guiana. *Schomburgk 651* (US, isotype).

Herbs procumbent to decumbent; stems terete, villous to pilous. *Leaves* unifoliolate, the leaflets ovate, 6.0–7.5 cm long, 1.5–3.0 cm wide, apically obtuse,

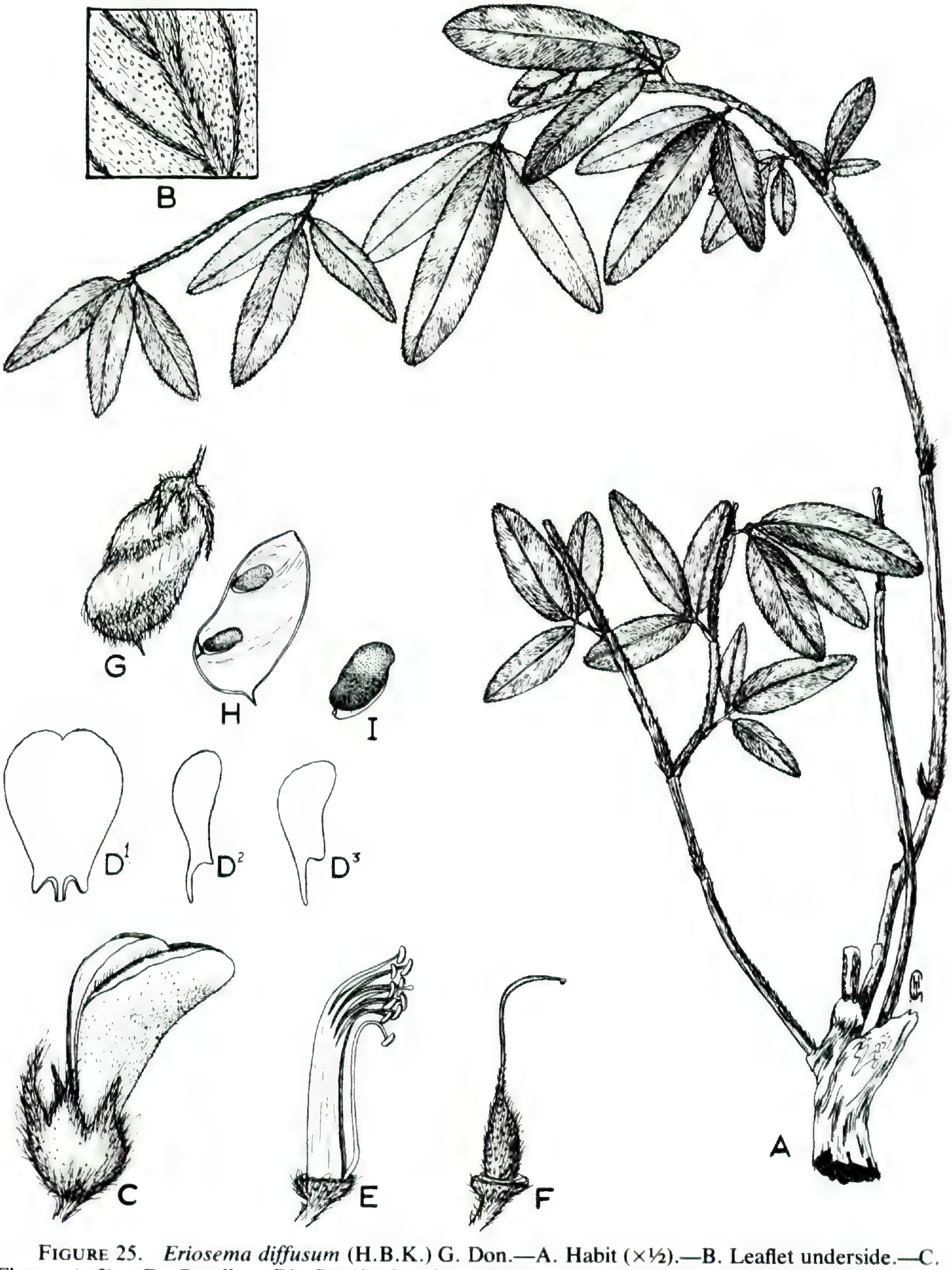

FIGURE 25. *Eriosema diffusum* (H.B.K.) G. Don.—A. Habit (×½).—B. Leaflet underside.—C. Flower (×3).—D. Corolla.—D^1. Standard (×2).—D^2. Wing petal (×2).—D^3. Keel petal (×2).—E. Stamens (×3).—F. Pistil (×3). [After *White 85.*]—G. Fruit (×1½).—H. Fruit opened to show seeds (×1½).—I. Seed (×3). [After *Davidson 728.*]

basally cuneate, the margins entire, sericeous on both the surfaces, occasionally strigose below; petioles 0.2–0.5 cm long, heavily strigose; stipules lanceolate, 0.4–1.0 cm long, 0.1–0.3 cm wide. *Inflorescence* few flowered with 2–4 flowers, 3.0 cm long; peduncle 1.5–1.8 cm long; pedicel 0.4–0.5 cm long; bracts lanceolate,

caducous, 0.4–0.8 cm long, 0.2–0.3 cm wide. *Flowers* with the calyx 0.5–0.6 mm long, the tube 2.0 mm long, strigose; corolla yellow, 0.9–1.0 cm long, the standard obovate, 1.1–1.3 cm long, 0.5–0.6 cm wide, auriculate at the base, the wings oblong, 1.1–1.2 cm long, 0.4–0.5 cm wide, the keel falcate, 1.2–1.3 cm long, 0.4–0.5 cm wide; stamens 1.0–1.2 cm long. *Fruit* ovate, 1.5 cm long, 0.7 cm wide, brown strigose; seeds ovate, 4.0 mm long, black.

Eriosema simplicifolium ranges from Central America and the Greater Antilles to northern South America. Grear (1970) has segregated *E. simplicifolium* into two varieties: var. *micranthum* is restricted to Bolivia, Paraguay, and southeastern Brazil and is differentiated by its smaller flowers and occasionally erect habit. However, *E. simplicifolium* appears to have continuous variation throughout its range in Panama and surrounding regions. In Panama *E. simplicifolium* occurs on llanos, usually in sandy soils.

CHIRIQUÍ: Llanos W of Gualaca, 500 ft, *Allen 5050* (GH, MO). San Félix, 0–120 m, *Pittier 5257* (NY, US).

4. **Eriosema violaceum** (Aubl.) G. Don, Gen. Hist. 2: 347. 1832.

Cystisus violaceous Aubl., Hist. Pl. Guiane 2: 766. 1775. TYPE: French Guiana, "Guianae in pratis Macouria," not seen.
Crotolaria lineata Lam. Encyl. Méth. Bot. 2: 202. 1786. TYPE: not seen.
Rhynchosia violacea DC., Prodr. 2: 388. 1825. TYPE: not seen.

Herb or *subshrub*, few to many branched; branches erect or ascending from a woody base; stems puberulent, villous. *Leaves* trifoliolate, the leaflets linear lanceolate, 4.7–8.0 cm long, 0.6–1.2 cm wde, apically obtuse, basally cuneate, the margins revolute, the upper and the lower surface strigose, the lower surface gland dotted, terminal leaflet ⅓ longer than the laterals; petioles 2.0–4.0 mm long, densely villous, appressed, the stipules lanceolate, striate, connate, pilose, persistent, 6.0–10.0 mm long, 2.0–3.0 mm wide. *Inflorescence* 4.7–7.0 cm long, multiflorate with 30–35 flowers, in loose clusters; peduncle 2.2–3.0 cm long; pedicel 1.8–2.0 mm long; bracts subtending the flowers caducous, ovate, 2.5–4.0 mm long, 1.5 mm wide; bracts subtending the inflorescence lanceolate, 0.6 cm long, 0.2 cm wide, striate, puberulent. *Flowers* with the calyx 0.3–5 mm long, the lobes 1.5–3.0 mm long, the upper lobe slightly longer, externally glandular, villous; corolla yellow, 6.0–8.0 mm long, the standard obovate, 7.0–8.0 mm long, 4.0–5.0 mm wide, auriculate at the base, the wings oblong, 7.0–7.5 mm long, 2.5–3.0 mm wide, the claw 2.0 mm long, the keel 7.0–7.5 mm long, 2.5–3.0 mm wide, the claw 3.0 mm long; stamens 7.0 mm long. *Fruit* ovate, 0.7–1.0 cm long, 0.4–0.6 cm wide, densely villous; seeds 3.5–4.5 mm long, oval black.

Eriosema violaceum ranges from southern Mexico and the Greater Antilles southward to central and northwestern Brazil. It occurs in savannas, cerrados and palm and pine forests and, particularly in Panama, along streambanks. *Eriosema violaceum* is distinguished by its narrow leaflets with revolute margins and its many flowered raceme.

CANAL ZONE: Río Azote, 66–70 m, *Dodge et al. 16847* (MO). COCLÉ: Penonomé, 50–1000 ft, *Williams 96* (NY). PANAMÁ: near Pacora, 0–100 m, *Burt & Rattray 18* (MO). Río Puente near junction

with Río Chagres, *Dodge et al. 16846* (GH, MO). Río Pacora and Chepo, *Duke 5912* (MO). Orillas del camino ca. 1.5 km del Río Cabra, camino a Chepo, *Taylor* (MO).

23. ERYTHRINA

John D. Dwyer[53] & W. G. D'Arcy[53]

Erythrina L., Sp. Pl. 706. 1753; Gen. Pl., ed. 5. 316. 1754. TYPE: *E. herbacea* L.

Micropteryx Walp., Linnaea 23: 739. 1850. LECTOTYPE: *M. poeppigiana* Walp. = *Erythrina poeppigiana* (Walp.) O. F. Cook.

Duchassaingia Walp., Linnaea 23: 741. 1850. LECTOTYPE: *D. glauca* Walp. = *Erythrina fusca* Lour.

Trees or *shrubs*, usually armed. *Leaves* alternate, pinnately 3-foliate, the leaflets large, the terminal leaflet usually larger than the laterals, the lateral leaflets usually inequilateral; stipels small; stipules minute, caducous. *Inflorescence* axillary or terminal; flowers numerous, disposed laterally in pseudoracemes; peduncles usually spineless; pedicels thickened distally. *Flowers* large; calyx inequilaterally campanulate or tubular, the margin subentire, lobed or vaguely toothed; standard often large, short or long clawed, thick, greatly exceeding the keel, the keel petals often coherent along the lower margin, apically glabrous; stamens 10, monadelphous or diadelphous with 9 stamens alternating long and short, the anthers versatile; ovary stipitate, fusiform, somewhat curved, the style slender, elongate, incurved, glabrous, the stigma capitate. *Legumes* stipitate, linear oblong, often moniliform, mostly constricted between the seeds, dehiscent, often twisted at maturity; seeds several, ellipsoidal, colored, the hilum lateral.

Erythrina includes about 108 species in tropical and subtropical areas of Old and New Worlds. It is distinguished from other Panamanian Papilionatae by its woody habit, red or orange flowers, by the wing petals being much smaller than the keel, and by the elongate stipe below the ovary.

The genus has been intensively studied for many years by B. A. Krukoff, New York Botanical Garden, and this treatment relies heavily on his published works and annotations on herbarium sheets. In addition, Mr. Krukoff supplied copious notes and advice which helped form a basis for this treatment. The key to species is modified from Krukoff's key.

Krukoff (1939) recognized 10 Species Groups in the New World *Erythrina*, but later Krukoff and Barnaby (1974) reorganized *Erythrina* on a worldwide basis, recognizing 5 subgenera and 26 sections. Two subgenera, *Micropteryx* and *Erythrina* occur in Panama, the first with sects. *Micropteryx* and *Duchassaingia*, and the second with sects. *Edules*, *Erythrina*, and *Gibbosae*. Section *Cristae-Galli* Krukoff (Subgenus *Micropteryx*) is introduced.

Flowers and fruits of all species of *Erythrina* were well illustrated by Krukoff and Barnaby (1974), and reference to these illustrations can be an aid in determining the plants.

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a. Seeds dark brown or black; calyx mostly campanulate; introduced and native species.
  b. Seeds 25–35 mm long, soft, drying wrinkled ---------- 5. *E. edulis*
  bb. Seeds 12–19 mm long, hard, drying smooth.
    c. Leaflets mostly blunt tipped; wing petals about ½ as long as the keel ---------- 6. *E. fusca*
    cc. Leaflets mostly sharp tipped; wing petals minute, less than ⅓ as long as the keel.
      d. Pod papery; stipels forming stalked cups 1–4 mm long ---- 9. *E. poeppigiana*
      dd. Pod leathery or woody; stipels less than 0.5 mm long, not forming stalked cups ---------- 4. *E. crista-galli*

aa. Seeds red; calyx mostly tubular campanulate; native species.
  e. Calyx truncate but with a conspicuous bulge on the ventral side just below the rim ---------- 7. *E. gibbosa*
  ee. Calyx 1 or 2 toothed (lobed), lacking a bulge on the side.
    f. Seeds less than 10 mm long; leaflets as broad or broader than long, blunt tipped (sometimes short acuminate) ---------- 1. *E. berteroana*
    ff. Seeds more than 10 mm long; leaflets longer than broad, sharp pointed.
      g. Pod persistently pubescent, at least between the seeds (lens may be needed).
        h. Keel petals united by outer margins; calyx at least twice as long as wide ---------- 3. *E. costaricensis*
        hh. Keel petals free; calyx less than ½ as long as wide ---- 8. *E. lanceolata*
      gg. Pod glabrous at maturity.
        i. Calyx with 2 subequal lips ---------- 2. *E. chiriquensis*
        ii. Calyx with 1 lip forming a pronounced beak ---------- 10. *E. rubrinervia*

1. **Erythrina berteroana** Urban, Symb. Ant. 5: 370. 1908. SYNTYPES: Colombia, Santa Marta, *Bertero 2126, 2772* (B, not seen).—FIG. 26.

E. neglecta Krukoff & Moldenke, Phytologia 1: 287. 1938. TYPE: Panama, *Williams 372* (NY, not seen).

Trees, branchlets smooth, lustrous, armed, the spines occasional, pyramidal, to 0.6 cm long, often obviously reflexed at the apex. *Leaves* with the leaflets 5–17 cm long, 5–20 cm wide, obliquely ovate to ovate rotund or the terminal leaflets subrhomboidal, as wide or wider than long, shortly acuminate apically, widely cuneate basally, the margins vaguely irregular, slightly revolute, thick chartaceous, smaller leaflets often subcoriaceous, glabrous above, minutely puberulent

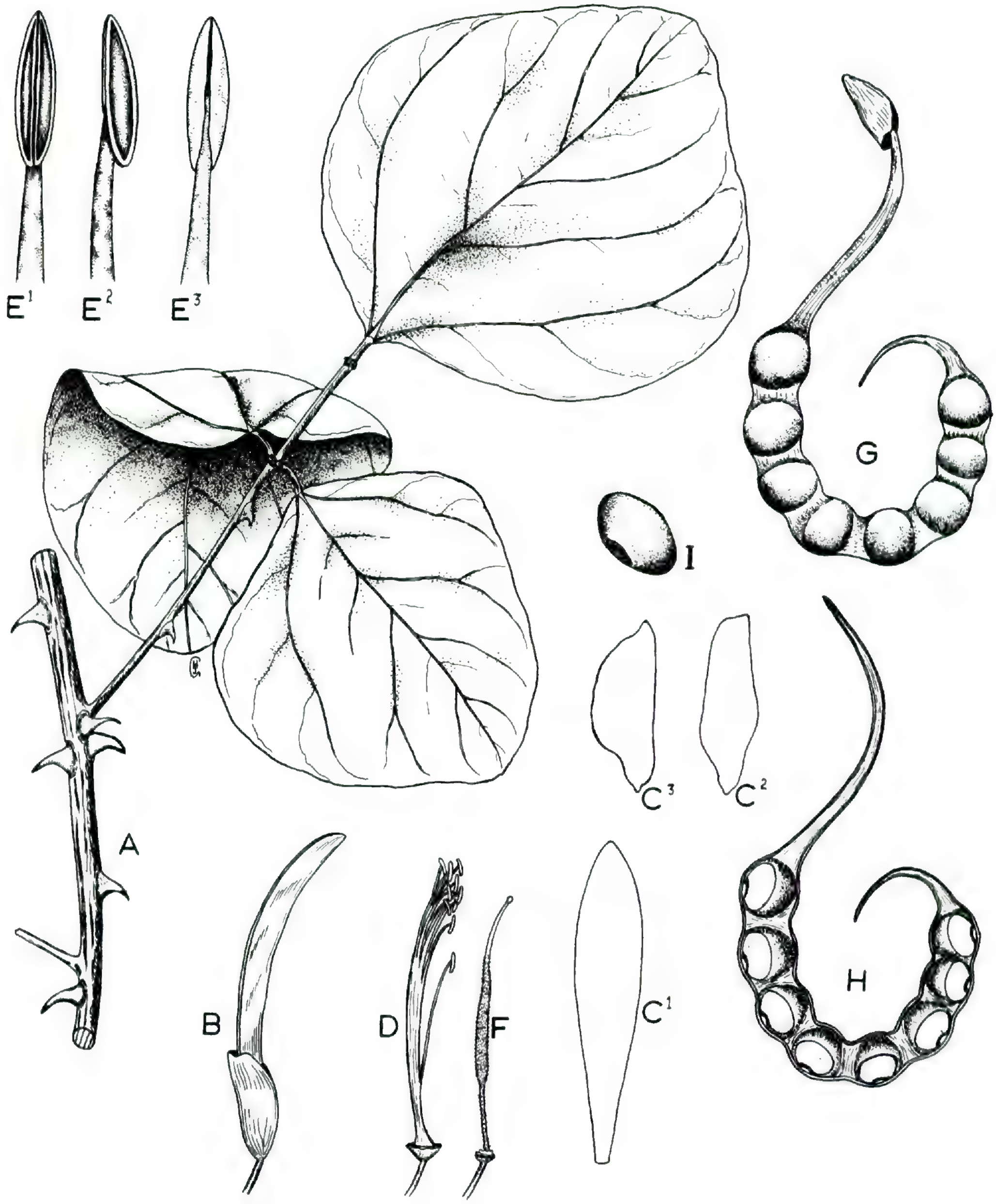

FIGURE 26. *Erythrina berteroana* Urban.—A. Habit (×½). [After *Dwyer 1237.*]—B. Flower (×½).—C. Corolla.—C^1. Standard (×½).—C^2. Wing petal (×1).—C^3. Keel petal (×1).—D. Stamens (×½).—E. Anthers.—E^1. Abaxial view (×5).—E^2. Lateral view (×5).—E^3. Adaxial view (×5).—F. Pistil (×½). [After *Allen 1631.*]—G. Fruit (×½).—H. Fruit opened to show seeds (×1).—I. Seed (×1). [After *Dwyer 1237.*]

beneath, often appearing glaucous, the main veins 5–6, petiolules to 1 cm long, glabrous, rugulose, often a different color than the rachis; petioles 4.5–15 cm long, glabrous; rachises 1.5–5 cm long, glabrous. *Inflorescences* to 0.5 m long, usually glabrous; pedicels to 10 mm long; bracts ovate, ca. 10 mm long; bracteoles narrowly ovate, acute, ca. 12 mm long. *Flowers* with calyx narrowly campanu-

late, ca. 16 mm long and 4 mm wide, stiffly carnose, minutely puberulent, the teeth distinguishable as irregular and rounded elevations, standard elliptic, ca. 80 mm long and 20 mm wide, thick petaloid, glabrous, the wings oblong, ca. 10 mm long and 2.5 mm wide, tapering only gradually basally, the claw ca. 2 mm long; keel petals subcircular, ca. 8.5 mm long and 6.5 mm wide; odd stamen free at the base, then united to the middle of the sheath, the other stamens of 2 lengths, the laterally disposed stamens free for ca. 15 mm, the median (carinal position) free for 4–7 mm, the anthers ca. 3 mm long; ovary slender, stipitate for 1.5 mm, linear, ca. 17 mm long and 1.5 mm wide, ferrugineous puberulent, the style ca. 30 mm long, the stigma capitate, ca. 0.3 mm long. *Legumes* stipitate moniliform, to 15 cm long and 1.5 cm wide, the stipe 2.5 cm long.

Erythrina berteroana is distinct in its small black-marked red seeds.

This species is well distributed throughout the West Indies and on the continent, ranging from Mexico to Colombia and Venezuela (Zulia). It occurs from low to middle elevations. In Panama, *Erythrina berteroana* occurs from sea level up to about 1,800 m, with most collections taken from tropical moist forest. It is one of the commonest species in the genus in Panama.

BOCAS DEL TORO: Almirante, *Sharp* 11 Nov. 1962 (SCZ). CANAL ZONE: Miraflores, *Blum 542* (FSU, MO, SCZ). Old gun site route C-2 past Pacific Saddle Club, *Blum 2056* (FSU, MO, SCZ). Without other locality, *Blum 2238* (FSU, MO, SCZ). Cocolí Road, *Correa & Gonzalez, 513* (MO, PMA, SCZ). NE of Madden Dam, *Correa & Stimson 31* (MO, SCZ). Highway near Paraíso, *Croat 7161* (MO). Summit Garden, *Croat 12313* (F, MO, SCZ). Near Boy Scout Road, *Croat 12916* (MO). Gaillard Highway near Paraíso, *Croat 13148* (F, MO). Near Summit Naval Radio Station, *Croat 14237* (MO). Between Farfan Beach and Vera Cruz, *Duke 11737* (MO). Summit Garden, *Dwyer 1237* (FSU, MO). Farfan Beach, *Dwyer et al. 4690* (MO). Cocoli Baptist Church, *Dwyer 7212* (GH, US). K-2 Road, *Dwyer & Hayden 7541* (GH, MO, US). Madden Dam, *Ebinger 854* (F, MO, US). Off road from Madden Dam to Chilibre, *Folsom 3661, 3662, 3663* (all MO). Paraíso, *Folsom 3664* (MO). Near Pina, *Gentry 8629* (MO). Río Providencia and ridge S of river, 5–170 m, *Gentry & Nee 8746* (MO). Back of Curundú, *Harvey 5255* (F). Without other locality, *Haynes 501/9305* (A). Farfan Beach and Palo Seco, 5 m, *Hunter & Allen 444* (GH, MO). Near Summit Gardens, *Kennedy et al. 2207* (MO). 4 mi SE of Gamboa on highway to Balboa, *Lasseigne 4286* (MO). 1 mi E of Canal Zone boundary, *Lazor 2866* (FSU). Madden Dam, 50 ft, *Lewis et al. 31* (MO). Cocolí Road, *Lewis et al. 776* (GH, MO, US). Sabana of Panamá, 10–50 m, *Pittier 2541* (US). Between Gatún and Lion Hill, 10–20 m, *Pittier 2571* (US). Big swamp E of Río Tocumen, *Standley 26704* (US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29037* (US). Balboa, *Standley 32125* (US). Madden Dam, Transisthmian highway, *Stern et al. 351* (GH, MO). Venado Beach near Fort Kobbe, *Stimson 5247* (SCZ). 1 mi N of Summit on road to FAA tower, *Tyson et al. 2749* (SCZ). Paraíso, *Tyson 5339* (FSU, MO, SCZ). Cocoli Baptist Church, *Tyson & Dwyer 6484* (MO, SCZ). CHIRIQUÍ: Remedios, 0–150 m, *Allen 3663* (MO, US). Quebrada Guanabanito 1 km W of La Represa, *Busey 487* (F). Boquete, 3800 ft, *Davidson 735* (A, MO, US). Santa Marta Bugaba, *de Caballero 19* (MO). Dolega, *Dwyer & Hayden 7758A* (MO). Between inspection station and Volcán, *Folsom 3935, 3836, 3937* (all MO). 1 mi N of Harias San Miguel, Concepción, *Folsom 3957* (MO). Boquete, 3800 ft, *King 5320* (US). 1 km E of Remedios, *Nee 10107* (MO). S side of Boquete, 1050–1100 m, *Nee 10642* (MO). Finca Collins, 5500 ft, *Stern et al. 1146* (GH, MO, US). Boquete, 1200–1500 m, *Woodson & Schery 751* (GH, MO). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 582* (GH, MO). El Valle, *Folsom & Kauke 2740* (MO); *Kennedy 2114* (MO), *2211* (F, MO); *Nee 9219* (MO). COLÓN: Quebrada Bonita 2 km NW of Salamanca, 90 m, *Nee 6994* (MO). DARIÉN: Slopes of Cerro Pirre, 200–500 m, *Gentry & Clewell 7045A* (MO). HERRERA: Ocú, *Stern et al. 990* (MO). LOS SANTOS: Between Limón and Punta Mala, *D'Arcy & Croat 4210* (MO). Punta Mala, *Tyson 2719* (MO, SCZ). Road from Macaracas to Chitré Highway, *Tyson et al. 3150* (MO, SCZ). PANAMÁ: Bejuco, *Allen 1631* (F, GH, MO, US). Río Maje 4–5 mi above falls near Bayano Lake, 100 m, *Croat 34673* (MO). Between Panamá and Chepo, *Dodge et al. 16639* (MO). Río Charco Espiritu on Tocumen Highway, *Duke 5694* (MO). Isla Saboga, *Duke 10366* (MO). Tocumen, *Dwyer 2103* (MO), *5017* (MO). Entrance to paved road to Cerro Azul from main highway, *Dwyer 3097* (MO). Near Chepo, *Hunter & Allen 27* (GH, MO); *Kluge 13* (US). Nuevo Guararé, Arraiján, 20 m, *Lao 112* (MO, PMA). Bellevista, *Macbride 2752* (F,

US). La Jagua, Pacora River, 25–30 m, *McDaniel 10332* (MO). Mamoní River above Chepo, 20–25 m, *Pittier 4731* (GH, US). Matías Hernández, *Pittier 6939* (F, GH, MO, US). Villa Rosario, *Saldaña 27* (PMA). Juan Franco Race Track, *Standley 27689* (US). Tumba Muerto Road near Panamá, *Standley 29783* (US). Juan Díaz, *Standley 30489* (US). Between Las Sabanas and Matías Hernández, *Standley 31897* (US). SAN BLAS: Mainland opposite Achituppu, *Lewis et al. 108* (GH, MO). VERAGUAS: 5 mi N of Santiago near Santa Maria River, *Blum & Tyson 593* (MO, SCZ). Between Santa Fé and Escuela Agricola Alto Piedras, 420 m, *Croat & Folsom 33835* (MO). San Francisco, *Dwyer 1293* (MO). 2 mi from Santiago toward Atalaya, *Dwyer et al. 7402* (US, MO). 1–2 mi above Santa Fé, *Gentry 3050* (MO); *Liesner 839* (MO). Just S of Santa Fé, *Nee 8023* (MO). 2 mi S of Cañazas, *Tyson 3724* (FSU). WITHOUT LOCALITY: *Lewis et al.* (MO).

2. **Erythrina chiriquensis** Krukoff, Brittonia 3: 322. 1939. TYPE: Panama, *White & White 31* (US, holotype, not seen; isotypes, MO).

Trees; branchlets smooth, armed, the spines deltoid, flat, to 1 cm long. *Leaves* with the leaflets ovate deltoid, 6–20 cm long, 4–12 cm wide, the terminal leaflets usually slightly larger, the acumen often to 1.5 cm long, truncate at the base, the margins vaguely revolute, thick chartaceous, glabrous above and below, the main veins 4–8; petioles 10–15 cm long, smooth, glabrous; rachises 3–4.5 cm long; stipules narrowly rectangular. *Inflorescences* with the peduncles to 27 cm long and 0.6 cm wide, rubescent, sympodium longer in fruit, pedicels 0.3–1.5 mm long. *Flowers* with the calyx narrowly campanulate, ca. 13.5 mm long and stiffly carnose to subcoriaceous, rough, glabrous to ferrugineous villosulose; teeth obsolete; standard subsessile, narrowly oblong, to 60 mm long, 5–15 mm wide, tapering gradually toward the apex, concave, subcuneate, basally carnose, glabrous; wing petals oblong to somewhat circular ca. 9.5 mm long, obtuse basally, delicately petaloid, glabrous except for the puberulent margins, the keel petals semicircular, 8.5–10 mm long, 6–7 mm wide, obliquely rounded, truncate basally, irregular undulate on the upper margin, thickened and puberulent on the lower margin, the claw ca. 1.5 mm long; staminal sheath 25–30 mm long, 1.5–3 mm wide, the long anthers ca. 3.3 mm long, glabrous, the short anthers ca. 2.5 mm long, pilose, the odd filament united to the sheath for ca. 8 mm then free for ca. 15 mm; ovary stipitate for ca. 7 mm, vaguely sigmoid and linear fusiform, ca. 13.5 mm long and 1.5 mm wide, the hairs ferrugineous, curled, the style subulate. *Legumes* stipitate for ca. 3 cm, to 13 cm long, 1.5–2 cm wide, narrowly cuneate apically, the beak to 3 cm long, ca. 0.6 cm wide basally, the seminiferous areas 2–3 per pod, often interrupted by a narrow constriction, 0.5–0.9 cm wide, to 5 cm long, smooth, vaguely reticulate, minutely ferrugineous farinose; seeds oblong, ca. 1.2 cm long, 0.6 cm wide, dull or bright scarlet.

Erythrina chiriquensis is known only from upland Chiriqui, Panama, where it is common. The pods tend to be much shorter than most other species in Panama and they are usually not moniliform or crinkled.

CHIRIQUÍ: Cerro Punta, 2000 m, *Allen 1526* (MO), *3474* (GH, MO). S of Finca Lérida, 6000–7000 ft, *Allen 4757* (GH, MO). Cerro Punta, 7000 ft, *Blum et al. 2440A* (FSU, SCZ); *Correa 1346* (MO); *Croat 10497* (MO, SCZ), *10526* (MO, SCZ). Between Boquete and Monte Rey, *Croat & Porter 15639* (MO). Cerro Punta, 6000 ft, *Folsom 3999* (MO). Nueva Suisa near Audubon Cabin, *Gentry 5992* (MO, GH, SCZ). Cerro Punta, *Lao 354* (MO); *Mori & Kallunki 5669* (MO); *Stern et al. 81* (MO, US); *Tyson 872* (FSU, MO), *5823* (FSU, MO, SCZ). Valley of upper Río Chiriquí Viejo, 1300–1900 m, *White & White 31* (MO). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 284* (GH), *295* (MO). Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 913* (A, MO, US).

3. **Erythrina costaricensis** M. Micheli, Bull. Herb. Boissier 2: 445. 1894. TYPE: Puntarenas, Costa Rica, *Pittier 4804* (BR, not seen).

E. panamensis Standley, J. Wash. Acad. Sci. 17: 10. 1927. TYPE: Panama, *Pittier 2656* (US, holotype: not seen).
E. colombiana Krukoff, Brittonia 3: 325. 1939. TYPE: Colombia, *Lawrance 648* (US, not seen).
E. costaricensis var. *panamensis* (Standley) Croat, Fl. B.C.I. 471. 1979.

Trees, the branchlets often with silver mottling, smooth, occasionally glabrous, often armed, the spines scattered. *Leaves* with the leaflets ovate trapeziform, obliquely ovate to ovate elliptic, 9–22 cm long, 6–20 cm wide, narrowly acuminate at the apex, oblique, rounded or widely cuneate at the base, thin chartaceous to subcoriaceous, reticulate, often glaucous beneath, glabrous to densely puberulent, the hairs appressed and often confined to the costa and secondary veins; petiolules 0.5–1.7 cm long, arachnoid villose to glabrescent; petioles 5–22 cm long; rachises 2–20 cm long. *Inflorescences* with bracts linear lanceolate, to 6 mm long, ca. 0.8 mm wide; bracteoles resembling smaller bracts. *Flower* with the calyx narrowly campanulate or tubular, 15–30 mm long, 8–10 mm wide, chartaceous to subcoriaceous, glabrous or puberulent, bilabiate, the lobes evanescent or to 7 mm long, the teeth scarcely evident; standard obovate elliptic or narrowly oblong, 60–75 mm long, 12.5–16 mm wide, tapering acutely apically, ultimately obtuse, obtuse basally, the claw to 9 mm long, stiff carnose or thin coriaceous, glabrous; wing petals obovate oblong or oblong, 7–9 mm long, obtuse apically and basally, delicately petaloid, the claw indistinct; keel petals circular oblong or inequilaterally ensiform, ca. 8 mm long, 3.5–10 mm wide, briefly broad acuminate apically, oblique basally, petaloid, glabrous, the claw indistinct; staminal sheath 1–2 mm wide medially, the filaments crassate, ca. 0.8 mm wide, the odd filament often briefly united to the sheath, the anthers 3–4 mm long; ovary flat, 10–15 mm long, puberulent, fusiform, sigmatioid, to 60 mm long, ca. 1 mm wide, ferruginous lanose, the stipe filamentous, the style flat basally, cylindrical subulate above, to 20 mm long. *Fruit* with stipes to 5 cm long, moniliform, 15–23 cm long, 1–2 cm wide, the style base to 5 cm long, farinose with minute deciduous hairs, some hairs persisting between the seeds, the seeds scarlet, ca. 1 cm long or longer and 0.7 cm wide.

Erythrina costaricensis is a species of the lowlands, occurring commonly in tropical wet and tropical moist forests. The species is known only from Costa Rica, Panama and Colombia.

Croat (1979) separated plants from lowland central Panama varietally from the typical Costa Rican plants, saying they have larger leaves, more constricted pods, red instead of orange flowers, and that the Panamanian plants bloom while leafless while those from Costa Rica are reported to bloom while bearing leaves.

BOCAS DEL TORO: Potrero, Changuinola Valley, *Dunlap 443* (F, US). Río Terebe between Quebrada Huron and Quebrada Schlunjik, *Kirkbride & Duke 458* (MO, SCZ). 10–15 mi inland from mouth of Changuiola River, *Lewis et al. 875* (GH, MO). Water Valley, *Wedel 1766* (MO). CANAL ZONE: BARRO COLORADO ISLAND: *Aviles 3* (F), *45* (MO); *Brown 16* (F); *Croat 6286* (MO, SCZ), *6476* (F, MO), *6490* (F, MO, SCZ), *6560, 6625, 8667, 12710* (all MO); *Frost 212* (F); *Harvey 50* (F); *Kenoyer 329* (US); *Killip 39975* (US), *40036* (MO, US); *Oppenheimer 67-1-17-1415* (MO); *Salvoza 874* (A); *Shattuck 56, 852* (both F, MO); *Standley 31352, 40892, 40843* (all US); *Woodworth & Vestal 311* (A,

F). W end of Gatún Lake and dam, *Blum & Tyson 2001* (FSU, MO, SCZ). Gamboa Pipe Line on Tropic Test Center lands 2 km S of main dirt road, *Correa & Haines 484* (MO). Pipeline road within 5 mi of Gamboa gate, *D'Arcy 9265* (MO). Hill C-6, Ft. Sherman, *Duke 4392* (MO). Pipeline road, *Folsom 1938* (MO). Río Providencia 3 km SE of Achiote, *Gentry & Nee 8657* (MO). Gatún, *Goldman 1854* (US). Gatún Station, *Hayes 97* (GH). Pipeline Road, Río Agua Salud, *Kennedy 1890* (MO). Río Indio de Gatún, *Maxon 4808* (US). Río Petitpie from Ft. Sherman–Gatun Locks road, *Mori & Kallunki 2659* (MO). Río Mendosa above Pipeline Road, *Nee 7601* (MO). Río Providencia 7.5 km SW of Gatún Dam, 25–140 m, *Nee & Gentry 8667* (MO). Between Gorgona and Gatún, *Pittier 2287* (US). Quebrada Bonita, 70–80 m, *Steyermark & Allen 1934* (GH, MO). Quebrada Salamanca, 70 m, *Steyermark & Allen 16984* (GH). Quebrada Ancha, 70 m, *Steyermark & Allen 16984a* (MO). 6 mi N of Gamboa near Río Frijol, *Tyson 1447* (FSU, MO, SCZ). CHIRIQUÍ: Progreso, *Cooper & Slater 10532* (F, US). San Bartolo Limite, *Croat 22010* (MO, US). Quebrada Melliza 6 mi S of Puerto Armuelles, *Liesner 496* (F, MO). COCLÉ: Cerro Pilón, *Correa 54* (MO, SCZ). La Mesa, *Croat 13370* (MO). 18 km past Sardinilla on way to Nombre de Dios, 150–300 m, *Croat 26126* (MO). La Mesa, 2200 ft, *Dwyer 10562* (MO). 7 km N of El Cope de Veraguas, Alto Calvario, *Folsom 1207* (MO). La Mesa above El Valle, *Folsom & Raul, 5637* (MO). 7 km N of El Copé, 750–850 m, *Folsom & Collins 6435* (MO). La Mesa N of Cerro Gaital, 2400 ft, *Hammel 3848* (MO). COLÓN: Tres Brazos sawmill, Icacal, between Salud and Boca de Río Indio, *Howell 63* (MO). Peluca on road to Nombre de Dios, *Kennedy 2776* (GH, MO). Río Buenaventura near Portobelo, *Kennedy & Gra 2248a* (MO). Río Guanche 6 km S of Portobelo, 0–10 m, *Nee 7268* (MO). Quebrada Ancha 4 km E of Buena Vista, *Nee 7776* (MO, US). Río Guanche, 50 m, *Sullivan 139* (MO). DARIÉN: S slope of W peak of Cerro Tacarcuna, 1100–1300 m, *Gentry et al. 16880* (MO). Río Cuasí, 0–2.5 mi S of Tres Bocas, *Kirkbride & Duke 1130* (MO). Between Caná & Boca de Cupe, *Stern et al. 633* (GH, MO, US). Río Cuasí, Chepigana District, 800 ft, *Terry & Terry 1413* (A, F, MO). Caná, *Williams 782* (US). PANAMÁ: El Jefe, *Duke 9398* (MO). Mountains above Tortí Arriba, *Folsom et al. 6594* (MO). Cerro Campana, *Gentry 4906* (MO). Without other locality, *Hayes* (GH). Cerro Campana, *Porter et al. 4280* (MO, SCZ). Cerro Campana, collector unknown, 25 Mar. 1969 (MO).

4. **Erythrina crista-galli** L., Mant. 99. 1767. TYPE: Brasil, not seen.

Armed *tree*, leafy when flowering. *Leaves* with the leaflets elliptic or ovate, 5–8 cm long, 2–3 cm wide, chartaceous, puberulent but soon glabrous, the costa sometimes armed beneath. *Inflorescence* of flowers solitary or in 2's or 3's in the leaf axils, often subterminal; pedicels 1.2–6 cm long, pubescent with deciduous hairs; bracts linear lanceolate, 2.4–3 mm long; bracteoles somewhat smaller. *Flowers* with the calyx papery, broadly campanulate, 10–17 mm long, slightly shorter on the upper side, 10–15 mm wide at the mouth, the apex bilobed, pubescent in bud, soon glabrous; standard red, elliptic, sometimes broadly so, ca. 4 cm long, 2.1–2.6 cm wide, the wings variously shaped, sometimes toothed, 7–12 mm long, the keel petals falcate, 32–53 mm long; stamens 3.6–6.2 cm long, separate for 0.3–0.7 cm; pistil 3.4–6 cm long, the ovary densely pubescent, the stipe sparingly pubescent. *Fruit* woody, 14–39 cm long, 1.2–1.5 cm wide, slightly constricted between the seeds, the stipe 2–4 mm long, somewhat expanded upwards, the acumen 0.7–1 cm long, slender but stiff; seeds black with dark markings, 12–19 mm long, 5–8 mm wide, hard, smooth.

Erythrina crista-galli is distinct among species of *Erythrina* growing in Panama in its dark seeds, in its short, wide calyx, and in its wing petals which are much shorter than the keel or standard.

The species occurs naturally in Brasil and is known in Panama only in cultivation. It is a favorite cultivated tree in some parts of the world, but only one collection has been made in Panama. The above description is taken mainly from Krukoff (1939).

CANAL ZONE: Albrook across from Building 808, *Tyson 6261* (MO).

5. **Erythrina edulis** Triana ex Micheli,[54] J. Bot. 6; 145. 1892. TYPE: Colombia, *Triana* (K, holotype, not seen).

Tree, sometimes armed. *Leaves* with leaflets ovate to broadly ovate, mostly 8–21 cm long, 5.5–16.5 cm wide, apically acute or acuminate, basally rounded, truncate, obtuse or cuneate, chartaceous or subcoriaceous, glabrous, not waxy, the principal secondary veins 7–12 on each side; costa sometimes armed; petioles puberulent, glabrescent, mostly 11–36 cm long; petiolules 3–11 cm long, 1.5–3.5 mm thick; rachises densely puberulent. *Inflorescences* with the bracts mostly lanceolate, to 5.2 mm long, 1.5 mm wide, the smaller ones broader; bracteoles resembling the smaller bracts but usually smaller, fruiting pedicels 0.7–1 cm long. *Flowers* with the calyx thin, papery, broadly campanulate, 8–11 mm long on the lower side, 7–10 mm long on the upper side, 8–10 mm wide at the mouth, the margin irregularly lobed, pubescent; standard broadly elliptic, 2–3.5 cm long, 1–2.5 cm wide, emarginate or retuse, clawed, the wings variously shaped, 3–6.5 mm long, the keel petals elongate orbicular, often lobed ventrally near the apex, 10–20 mm long; stamens 2–3.5 cm long; ovary 1.8–3 cm long, densely pubescent, stipitate. *Legume* somewhat woody, thick, mostly 13–25 cm long, ca. 2 cm wide, the acumen ca. 2 cm long, the stipe slender, 3.5–4.5 cm long; seeds 5–6, dark brown, 25–35 mm long, 10–18 mm wide, soft, drying wrinkled.

Erythrina edulis is cultivated for its pods which are boiled or fried. It ranges from Panama to Bolivia, occurring mostly at 1,000–2,500 m elevation, but it sometimes occurs nearly at sea level. In Panama it is known only from upland Chiriquí.

CHIRIQUÍ: Finca Collins, Boquete, *Blum & Dwyer 2530A* (SCZ). Lower road to Bajo Mono, *Folsom et al. 2229* (MO). N slope of Barú E of Bajo Chorro region, 600–6500 ft, *Hammel 3017* (MO). Quebrada El Velo near Finca Lérida, 1700 m, *Nee 10624* (MO). Bajo Mono ca. 3 km NW of Boquete, 1400 m, *Skog et al. 4062* (MO). Boquete above Jaramillo, N slopes of Cerro Palo Alto, 4000 ft, *Webster 16663* (MO).

6. **Erythrina fusca** Loureiro,[55] Fl. Cochinch. 427. 1790. Based on *Gelala aquatica* Rumphius, Herb. Amb. 2: 235, *tab. 5*. 78. 1750.

Large *trees*. *Leaves* with the leaflets ovate to oblong, 7–14 cm long, 5–11 cm wide, round obtuse apically, obtuse to vaguely cordate basally, thin coriaceous, minutely bullate, usually green, glabrous above, puberulent to minutely farinose below, the principal secondary veins, 6–9, the costa prominulous above, often aculeate; petioles 9–13 cm long, ca. 0.3 cm wide, minutely puberulent to glabrous; rachises 8–25 cm long, pubescent, often aculeate. *Inflorescence* with bracts and bracteoles ovate or broadly ovate, to 2 mm long; pedicels to 2 cm long and 0.2 cm wide. *Flowers* with the calyx broadly campanulate, to 17 mm long, asymmetric, longer on the lower side, chartaceous, pubescent, the hairs deciduous, the teeth scarcely evident; standard orange, trapeziform, to 90 mm long and 40 mm wide, widely deltoid apically, obtuse basally, coriaceous, glabrous, the claw

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[54] For additional synonyms see Krukoff & Barneby (1974). Only this name has been used for Panamanian plants.

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ca. 20 mm long, the wing petals obliquely semicircular, ca. 25 mm long and 20 mm wide, obliquely rounded apically, the claw scarcely evident, the keel petals connate, ovate falcate, about twice the length of the wing petals, 12–17 mm wide, truncate, oblique basally; staminal sheath ca. 17 mm long, coriaceous, glabrous, the filaments crassate, ca. 1 mm wide, the anthers ca. 4 mm long, the odd stamen ca. 35 mm long; ovary stipitate for ca. 15 mm, linear, ca. 10 mm long, puberulent, the style linear subulate, ca. 15 mm long, erect. *Legume* with the stipe linear cuneate, ca. 3 mm long, moniliform, ca. 20 cm long and 1.5 cm wide, the beak ca. 2 cm long, falcate, farinose; seeds ca. 1.5 cm long and 0.7 cm wide, opaque, drying brown, smooth, hard, the scar to 0.7 cm long.

Erythrina fusca is the most widespread species in the genus, occurring in the American tropics and from Madagascar to Tonga and the Caroline Islands in the Pacific Ocean. It is apparently dispersed by ocean currents, and it is commonly planted for shade. In Panama it occurs in the lowlands, commonly in tropical moist and tropical wet forests.

BOCAS DEL TORO: Farm Six, Almirante, *Cooper 471* (MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 8203* (F, MO, SCZ, US), *15159* (MO, SCZ); *Foster 2180* (F, GH, US); *Kenoyer 395* (US); *Woodworth & Vestal 507* (A, F, MO). Miraflores, *Blum 2212* (FSU, SCZ). Bohio, *Christopherson 142* (US). Between Paraiso and country club, *Croat 7170* (MO). Near Albrook Air Force Base, *Croat 13146* (MO, SCZ). Chagres, *Fendler 81* (GH, MO, US). S end of Pedro Miguel locks, *Graham 305* (GH). Gatún, *Hayes* Jan. 20, 1860 (MO). Las Cruces Trail, 75 m, *Hunter & Allen 450* (GH, MO). Summit Road, *Jones 288* (US). Below Gatún, *Maxon 4790* (US). Between Gatún and Lion Hill, 10–20 m, *Pittier 2571* (GH). Ancón, *Pittier 2744* (US). Darién Station, *Standley 31645* (US). Miraflores Locks, *Stern et al. 3* (GH, MO, US). Curundú, *Tyson 2632* (FSU, MO, SCZ, US). Between Fort Davis and Fort Gulich, *Tyson & Lazor 6236* (FSU). Miraflores Lake, *White & White 62* (MO, US). CHIRIQUÍ: Burica Peninsula, Puerto Limones, *Croat 22121A* (MO). COLÓN: Juan Mina Plantation, Río Chagres above Gamboa, *Allen 4104* (MO). Río Gatuncillo, Santa Rosa, 25 m, *Allen 4155* (MO). 5–7 mi SW of Portobelo towards María Chiquita, *Wilbur & Weaver 11169* (F, MO, US). PANAMÁ: Arraijan, *Allen 1628* (F, GH, MO, US). Tocumen, *Cedeno 16* (MO). Without other locality, *Cotterman & Klawe*, 3 July 1960 (US). Panamá Viejo, 5–10 m, *Dodge 17518* (GH, MO). Tocumen, *Dwyer* 31 Dec. 1962 (MO). Between Río Pacora and Chepo, *Dwyer et al. 5093* (MO, SCZ). San Jose Island, *Johnston 955* (GH). Cerro Azul, *Lao 484* (MO). Panama City, *Macbride 2608* (F, US). Nuevo reparto el Carmen a 500 m de la Transistmica, *Osorio 44* (MO). Sabanas N of Panama City, *Paul 362* (US). Matías Hernández, *Pittier 6942* (GH). Big swamp E of Río Tocumen, *Standley 26524* (US). Corozal Road near Panamá, *Standley 26779* (US). Juan Díaz, *Standley 30503* (US). Between Matías Hernández and Juan Díaz, *Standley 31933* (US).

7. **Erythrina gibbosa** Cufod., Arch. Bot. Sist. 10: 34. 1934. TYPE: Costa Rica, Alajuela, *Brenes 828* (NY, fragm.).

Small *trees* or *shrubs*, usually leafless at anthesis; twigs drying yellow, armed with spines to 0.8 cm long, moderately appressed pilose. *Leaves* with the terminal leaflets ovate lanceolate or rhombic ovate, 8–30 cm long, 4–15 cm wide, long acuminate apically, cuneate to truncate basally, chartaceous, sparsely pubescent to glabrous; petiolules to 0.8 cm long; petioles 10–15 cm long, to 0.3 cm wide, the spines occasional; rachises 2–3.5 cm long, pubescent; stipules narrowly lanceolate, to 2 cm long. *Inflorescences* ca. 15 cm long, densely villose above; bracts linear lanceolate, to 4 mm long and 1 mm wide. *Flowers* with the calyx campanulate, ca. 15 mm long and 9 mm wide apically, to 3 mm wide basally, conspicuously ventricose on the lower surface, chartaceous, puberulent or glabrous, thickened apically on the lower side, the teeth scarcely evident; standard subsessile, narrowly oblong, ca. 60 mm long and 12 mm wide, acute apically, cuneate basally,

carnose, glabrous, the wing petals narrowly oblong, ca. 11 mm long and 4 mm wide, obtuse apically, petaloid, the claw scarcely measurable, the keel petals ca. 10 mm long and 5 mm wide medially, obliquely acute apically, obtuse basally, the claw inconspicuous; staminal sheath ca. 2.5 mm wide, the filaments to 20 mm long, the median anthers pubescent, the anthers 2–3 mm long; ovary stipitate for 17 mm, linear falcate, ca. 20 mm long and 1.5 mm wide, the hairs dense, soft, appressed, the style curved, ca. 17 mm long. *Fruits* subligneous, coiled and twisted when mature, conspicuously and irregularly undulate crenulate on the ventral side; seeds uniformly scarlet, soft, wrinkled when dry.

Erythrina gibbosa occurs in Central America from Honduras to Panama. In Panama it has been collected from sea level to about 1,200 m.

BOCAS DEL TORO: Chiriqui Lagoon, *Wedel 1196* (GH, MO, US). Río Cricamola between Finca St. Louis & Konkintoe, 10–50 m, *Woodson et al. 1930* (A, MO, GH, US). CHIRIQUÍ: Volcán Chiriquí and Río Chiriquí Viejo, 1200 m, *Allen 995* (MO). Palo Santo 3 mi N of Volcán, *Croat 13580* (FSU, MO). Upper Río Gariché, 1050–1100 m, *Seibert 364* (A, MO). COCLÉ: El Valle, *Allen 110* (A, MO), *765* (MO), *2714* (MO, US), *3622* (GH). Club Campestre, *Duke 13232* (MO) El Valle, *Dwyer & Correa 8019* (MO); *Dwyer 1839a* (US); *Folsom & Kauke 2755* (MO); *Gentry 6794* (MO); *Hunter & Allen 330* (GH, MO, US); *Kennedy et al. 2212* (F, MO); *Lao 276* (MO). VERAGUAS: Río Tercero Braso above Santa Fé, *Croat 27335* (MO). Alto Piedra Santa Fé, *Lao 514* (MO). N of Santa Fé, *Mori & Kallunki 2537* (MO). 11 km from Escuela Agricola Alto de Piedra, Río Dos Baca, *Mori & Kallunki 3125* (MO). WITHOUT LOCALITY: *Moore 41* (F).

8. **Erythrina lanceolata** Standley, Contr. U.S. Natl. Herb. 17: 432. 1974. TYPE: Costa Rica, *Wercle* (*Pittier 3693*) (US, not seen).

Shrub or small *tree*, leafy when blooming; often armed. *Leaves* with the leaflets ovate, apically acute to long acuminate, basally rounded or obtuse, chartaceous, soon glabrescent above, beneath becoming glabrous or remaining sparingly puberulent with sparse, weak hairs, and with a minute waxy reticulum visible under a lens, unarmed, the petioles about as long as the terminal leaflet. *Inflorescence* with the bracts linear lanceolate, 1–1.3 mm long, ca. 0.3 mm wide, the bracteoles slightly smaller; pedicels 0.3–1 cm long, thick and longer in fruit. *Flowers* with the calyx thin, campanulate, 7.5–17 mm long, slightly shorter on the lower side, 5.5–8 mm wide at the mouth, the apex slightly bilobed, sparsely pubescent with appressed hairs, soon glabrescent; standard scarlet, narrow, oblanceolate, 4–8 cm long, 1–2 cm wide, rounded or retuse apically, the wings mostly rounded, not hastate, the keel petals 5–12 mm long, about equalling the wings; stamens 3.6–6.1 cm long, free for 1–2.4 cm; pistil 3.2–5.3 cm long, the stipe and ovary pubescent. *Legume* linear, terete, compressed between the seeds, 15–32 cm long, the pubescence persistent at least between the seeds, the stipe mostly 4–8 cm long, the acumen 2–8 cm long; seeds scarlet, unmarked, 10–13 mm long.

Erythrina lanceolata ranges from Honduras to Panama, occurring mostly at middle elevations. The species is attributed to Panama on the identification of a single collection of the species by Krukoff. As little material was available for study, none in flower, many details of the above description were taken from Krukoff (1939).

CHIRIQUÍ: 2.5 km from Questa Piedra along Río Monte road, *Folsom 3986* (MO).

9. **Erythrina poeppigiana** (Walp.) O. F. Cook, Bull. U.S. Dept. Agric. Bot. 25: 57. 1901.

Micropteryx poeppigiana Walp., Linnaea, 23: 740. 1850. TYPE: Peru, *Poeppig* (not seen; photos F, GH, NY).

Erythrina darienensis Standley, Contr. U.S. Natl. Herb. 18: 108. 1916. TYPE: Panama, *Pittier 5578* (US, holotype; isotypes, GH, NY).

Large *trees,* often armed. *Leaves* with the leaflets rhomboid or deltoid, deltoid ovate to suborbicular, 5–18 cm long, 5.5–15 cm wide, acuminate or obtuse at the apex, the base variable, thinly chartaceous, usually scabrous beneath; stipels forming stalked cups 1–4 mm long; petioles 10–30 cm long; rachises elongate. *Inflorescences* to 35 cm long; bracts ovate, to 1.5 mm long, ca. 0.8 mm wide, the bracteoles somewhat smaller than the bracts. *Flowers* with the calyx narrowly cylindrical campanulate, ca. 5 mm long and wide, the teeth absent or present as glandular points, carnose, minutely puberulent; standard scarlet, elliptic, to 50 mm long and 20 mm wide, varying from acute to obtuse apically and basally, the claw scarcely evident, the wing petals obovate or oblong, ca. 12 mm long and 5 mm wide, rounded, tapering obtusely basally, glabrous, the claw indistinct, the keel petals falcate, to 45 mm long and 10 mm wide; staminal tube 30–40 mm long, ca. 1 mm wide; pistil to 50 mm long, the stipe glabrous, the ovary linear, finely puberulent, the style filiform sigmatoid. *Legume* chartaceous, to 25 cm long and 1.5 cm wide, the seeds coffee colored, ca. 12 mm long.

Erythrina poeppigiana ranges from Panama to Bolivia. In Panama it has rarely been collected, and all collections are from the lowlands.

CANAL ZONE: Summit road, *Jones 284* (US). DARIÉN: Boca de Pauarando on Sambú River, *Pittier 5578* (GH, MO-photo, NY, US).

10. **Erythrina rubrinervia** H.B.K., Nov. Gen. Sp. Pl. 6: 434. 1824. TYPE: Colombia, *Humboldt & Bonpland 1787* (not seen; photo NY).

Shrub or small *tree,* usually armed, leafy when flowering. *Leaves* with the terminal leaflet rhombic ovate, mostly 10–20 cm long, 5–12 cm wide, apically acuminate, basally cuneate, unarmed, the secondary veins 8–11 on each side, chartaceous, soon glabrescent, minutely reticulate waxy beneath; petiolules 8–30 cm long, often armed, soon glabrescent; petioles 4.5–10 mm long; 1–2.5 mm thick, soon glabrescent. *Inflorescences* with the bracts caducous, the bracteoles narrowly elliptic, ca. 1 mm long, ca. 0.3 mm wide, the pedicels 0.3–0.9 cm long, pubescent, becoming 0.9 cm long in fruit. *Flowers* with the calyx thin, tubular campanulate, 14–30 mm long on the lower side, 10–21 mm long on the upper side, narrowed toward the base, 4–6 mm wide at the top, the margin entire but with the lowest tooth 1.5–2 mm long, glabrescent; standard scarlet, narrowly elliptic oblanceolate, 4.5–7.5 cm long, rounded or subacute, the wing petals apically denticulate, mostly slightly smaller than the keel petals, the keel petals abruptly acute or acuminate, 6–12 mm long, 4–5 mm wide; stamens 4.3–6.6 cm long, free for 1–2 cm; ovary and stipe densely pubescent. *Legume* somewhat woody, 18–36 cm long, ca. 1.5 cm wide, constricted between the seeds, the stipe 3–5 cm long, the acumen 3–6 cm long; seeds numerous, uniformly scarlet, 10–12 mm long, 6–8.5 mm wide.

This species occurs in Belize, Panama, Colombia, Peru and Bolivia. It is usually a species of middle elevations occurring between 1,000–2,500 m.

DARIÉN: Premontane rain forest E of Tres Bocas, *Kirkbride & Duke 1211* (MO). PANAMÁ: 8 km SW of Cerro Brewster, 300 m, *Lewis et al. 3480* (MO). VERAGUAS: Valley of Río Dos Bocas 15.6 km NW of Santa Fé, *Croat 27763* (MO).

24. FLEMINGIA

Muriel E. Poston[56]

Flemingia Roxb. in Ait., Hort. Kew., ed. 2. 4: 349. Dec. 1812. nomen cons. vs. *Flemingia* Rottl. (1803, Acanthaceae) et *Lourea* St. Hil. (1812). TYPE: *F. strobilifera* (L.) Ait.

Shrub. *Leaves* unifoliate; leaflets oblanceolate, glabrous above, gland-dotted below; stipules lanceolate, caducous, striate; stipels absent. *Inflorescences* axillary racemes; bracts foliaceous, persistent, overtopping the flowers. *Flowers* with calyx campanulate, the lobes subequal, the upper lobes free; corolla yellow with maroon striation, the standard obovate, auriculate, the wings oblong, the keel falcate; stamens diadelphous, the anthers monomorphic; ovary subsessile, short with 2 ovules, the style slender, the stigma capitate. *Fruits* oblong, turgid; seeds 1–3, the hilum short.

Flemingia is an Old World genus that has been introduced into the New World.

1. **Flemingia strobilifera** (L.) Ait., Hort. Kew., ed. 2. 4: 350. 1812.—FIG. 27.

Hedysarum strobiliferum L., Sp. Pl. 746. 1753. TYPE: India, not seen.
Moghania strobilifera (L.) St. Hil. ex Jackson, Index Kew. 2: 252. 1894.

Shrub or *subshrub*; stems terete, strigose. *Leaves* unifoliate; leaflet ovate to obovate, 9.5–15.0 cm long, 4.0–9.0 cm wide, apically acute, basally truncate to cuneate, glabrous to puberulent above, gland-dotted to villous beneath, the margins revolute; petiole 1.0–2.0 cm long, strigose; stipules lanceolate, striate, 3.0–4.0 mm long, caducous. *Inflorescences* exceeding the leaves, racemes or terminal panicles, distichous, 6.0–15.0 cm long, 15–20 flowered; peduncle 1.0–2.0 cm long, strigose; pedicel 2.0–3.0 mm long, strigulose; flowers 1–2 per node; bracts conspicuous, enclosing the flowers, obovate to cordate, 1.5–2.0 cm long, 0.8–1.2 cm wide, mucronate, basally truncate, strigulose, gland-dotted; bracteoles subtending each flower, ca. 1.0 mm long, strigulose. *Flowers* with the calyx campanulate, 4.5–5.0 mm long, the tube ca. 1.0 mm long, the upper lobe of calyx somewhat longer than others, corolla 6.0 mm long, the banner orbicular, 5.0–6.0 mm long, 7.5–8.0 mm wide, auriculate, the claw ca. 1.0 mm long, the wing oblong, not auriculate, 5.5–6.0 mm long, 1.0 mm wide, the claw 2.0 mm long, the keel falcate, 8.0 mm long, 2.0 mm wide, the claw 2.0 mm long; stamens 6.0 mm long, vexillary stamen free; ovary sessile to subsessile, the style slender, the stigma capitate. *Fruits* oblong, turgid, 0.8–1.0 cm long, 0.3–0.5 cm wide, twisting in dehiscence,

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FIGURE 27. *Flemingia strobilifera* (L.) Ait.—A. Habit (×½).—B. Flower (×4).—C. Glandular hairs.—D. Corolla.—D¹. Standard (×3).—D². Wing petal (×3).—D³. Keel petal (×3).—E. Stamen (×5).—F. Pistil (×5). [After *Wedel 1863*.]—G. Fruit (×3).—H. Fruit opened to show seed (×3). [After *Allen 2078*.]

the beak ca. 1.0 mm long, strigose; seeds 2(–3), ovoid, 3.0 mm long, brown black with red mottling, the hilum ovate, 1.0 mm long, estrophiolate.

BOCAS DEL TORO: Old Bank Island, Chiriqui Lagoon, *Wedel 1863* (MO). CANAL ZONE: Summit, *Allen 2079* (F, GH, MO). Transisthmian highway, Atlantic side, *Blum & Dwyer 2138* (MO). W end of Gatún Lake dam, *Blum & Tyson 1974* (MO, SCZ). Cocoli Road, *Burch et al. 1392* (F, GH, MO, NY, SCZ). Contractors Hill, *Correa & Gonzales 517* (FSU, GH, MO, NY, SCZ). Between Paraiso and Country Club, *Croat 7168* (MO). 1 mi N of Summit Gardens, *Croat 9090* (MO, SCZ). Las Cruces

Trail, *Dwyer 1953* (FSU). Albrook, U.S. Army Tropic Test Center site, *Dwyer 6590* (MO). Cocoli Road, *Dwyer 7227* (GH, MO). Madden Dam, *Dwyer 8375* (MO). Albrook, U.S. Army Tropic Test Center site, *Dwyer & Robyns 4* (MO). K-9 roadside, *Gale* Sept. 12, 1962 (SCZ). Boyd-Roosevelt highway at Río Escondido, *Graham 322* (GH). W bank of Canal opposite Miraflores, *Harvey 5226* (F). Without other locality, *Humphrey 241* (F, MO). 3 mi above Gamboa Bridge, *Kennedy et al. 2301* (F, MO, NY). 3 mi N of Miraflores on Balboa highway, *Lazor & Blum 5337* (SCZ). ½ mi N of Gamboa, *Lazor & Tyson 5689* (MO). Contractors Hill, *Lewis et al. 2875* (DUKE, MO). Road S-1 between Gatún and Pina, Fort Sherman, *Liesner 1337* (F, MO, NY). Headwaters of Río Providencia, 7.5 mi SW of Gatún Dam, *Nee & Gentry 8675* (MO). Madden Dam, *Nee & Mori 3682* (MO). Fort San Lorenzo, *Tyson & Blum 3752* (SCZ). 2 mi from Summit Garden SE to Gamboa, *Wilbur & Teeri 13381* (DUKE). COLÓN: Santa Rosa, Río Gatuncillo, *Allen 4160* (MO). Salamanca, *Gentry 6699* (MO); *Nee 9071* (MO). Roadside between Limón and Buena Vista, *Wilbur & Weaver 10817* (DUKE, GH, MO). DARIÉN: Hydro camp Pico Pendejo on Río Sabana, *Duke 15448* (MO). PANAMÁ: Nuevo Emperador, *Sandoval 21* (DUKE, MO).

25. GALACTIA

W. G. D'Arcy[57]

Galactia P. Br., Civ. Nat. Hist. Jam. 298. 1756. TYPE: *G. pendula* Pers.

Herbs, trailing or climbing vines or rarely shrubs, perennial. *Leaves* pinnate (Panama) or digitate trifoliolate or simple; stipels and stipules present. *Inflorescences* axillary and terminal, nodose racemes, elongate or short, sometimes subsessile; bracts and bracteoles usually present. *Flowers* mostly pink, purplish or white, the calyx 4-dentate or 4-fid, the upper tooth broader; corolla glabrous or the standard somewhat pubescent; stamens united or the vexilary stamen free, the anthers alike, all fertile, sometimes alternating in height; ovary narrow, mostly pubescent, the style glabrous, curved or nearly straight, the stigma minute. *Fruit* straight or slightly curved, compressed, sometimes laterally compressed between the seeds or marginally when immature, partially false septate between the seeds, dehiscent by 2 valves; seeds ovoid, dark brown, the hilum small, oval.

Galactia includes about 50 species of temperate and tropical regions of the world, the species most numerous in South America and the Antilles.

a. Plant erect or ascending, sometimes lax and scandent at the top, not reaching 1 m tall; petiolar rachis less than 5 mm long; leaflets mostly less than 2.5 cm long; standard exceeding the wings and keel ---------- 1. *G. latisiliqua*

aa. Plant a trailing or climbing vine, mostly exceeding 1 m in length; petiolar rachis more than 5 mm long; leaflets mostly more than 2.5 cm long; standard hardly exceeding or shorter than the wings and keel ---------- 2. *G. striata*

1. **Galactia latisiliqua** Desv., Ann. Sci. Nat. 9: 414. 1826. SYNTYPES: ? Peru, Dombey; Sine loc. ex don. Lavallee (both P, neither seen).

Wiry perennial *herb* or *suffrutex,* erect or ascending, apically somewhat scandent, rooting from a short slender tap root, branching at the ground and only sparingly above; stems densely pubescent, tardily glabrescent. *Leaves* pinnate, trifoliolate, the leaflets alike, the lateral pair slightly smaller, thick, ovate, mostly (Panama) 1.5–2.5 cm long, apically rounded, mucronate, basally rounded or obtuse, the veins 3–5 on each side, prominent beneath, above ascending pilose to glabrous, beneath pilose to appressed pubescent; petiolules 1–1.5 mm long, drying

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dark, pubescent; rachis to 3 mm long; petioles shorter or longer than the terminal leaflet. *Inflorescence* lax, few flowered, to 3 cm long, peduncle slender, puberulent; pedicels 1–2 mm long, glabrate; bracts ca. 1 mm long, pubescent. *Flowers* pink, ca. 7 mm long, the calyx pubescent, 4-fid about ⅔ way down, the standard longer than the wings, erect. *Legume* flat, oblong, slightly falcate, 3–4 cm long, ca. 5 mm wide, softly pubescent on the sides, the margin straight, the valves slightly compressed between the seeds, tardily dehiscent, ultimately curling; seeds 6–10, brown and mottled, compressed ovoid, 3–4 mm long.

This species may be distinguished by its non-climbing habit. *Galactia latisiliqua* is a South American species hitherto reaching only as far north as Colombia (Santander) and Guyana. Material from Panama is doubtfully identified with this species as material seen from South America is more pubescent and has somewhat larger leaves than the plants from Panama. It is possible that the Panamanian collections represent depauperate individuals of *G. striata*. They are smaller in most parts than material of *G. striata* seen from many countries.

All Panamanian collections were made in the Pacific lowlands of western Panama during the dry season.

CHIRIQUÍ: Roadside, Veladero, 0–100 m, *Burt & Koster 126* (MO). Concepción, *Burt & Koster 143* (MO). Gualaca nursery bed, 0–100 m, *Koster 174* (MO). VERAGUAS: Trail between Cañazas and Cordillera Central, 300–600 m, *Allen 192* (MO).

2. **Galactia striata** (Jacq.) Urban, Symb. Ant. 2: 320. 1900.—FIG. 28.

G. striata Jacq., Hort. Bot. Vindob. 1: 32, *tab. 76*. 1770 [1771]. TYPE: Jacquin (BM, not seen).
G. tenuiflora (Willd.) Wight & Arn., Prod. Fl. Penin. Ind. Orient. 1: 761. 1842.
G. striata var. *tenuiflora* (Willd.) Burk., Darwiniana 16: 721. 1971.

Trailing or prostrate perennial *vine*, not rooting at the nodes; stems pubescent to tomentose with weak hairs to 1.5 mm long. *Leaves* pinnate trifoliolate; leaflets about equal or the lateral pair slightly shorter, symmetrical, ovate, mostly 3–6 cm long, 2–3 cm wide, apically obtuse, minutely emarginate and mucronulate, basally rounded, slightly discolorous, thin pilose with loose hairs, more so beneath, often glabrescent above, the costa and 4 main veins on each side prominent beneath, often glabrescent above, the costa and 4 main veins on each side prominent beneath; petiolules ca. 2 mm long, often conspicuously 2-angled; foliar rachis 5–8 mm long; petiole mostly shorter than the leaflets; stipels glabrous, ca. 1 mm long; stipules 1–2 mm long, pilose. *Racemes* mostly solitary, lax, open, 5–10 cm long, the peduncle and rachis pubescent; pedicels 1–2 mm long, 1–3 arising at a node, puberulent, the bracts ca. 1 mm long, cucullate, pubescent. *Flowers* 8–10 mm long, pink, mostly drying white, the calyx puberulent, deeply 4-fid, the lobes narrowly acute; corolla exserted ½–⅓ way from the calyx, the standard reflexed, glabrate, the wings about as long as the standard, broad; anthers linear, 0.6 mm long, versatile; ovary linear, tomentose, the style glabrous, the stigma minute. *Legume* flat, oblong, sometimes falcate, mostly 3–5 cm long, ca. 5 mm wide, the margins thick, straight or slightly undulate between the seeds when young, the persistent style forming a small beak, sessile in the calyx, softly pilose on the valves, and on the margins with minute straight whitish hairs, the valves separating and ultimately curling; seeds mostly 5–8, ovoid, oblique, 3.5–5.5 mm

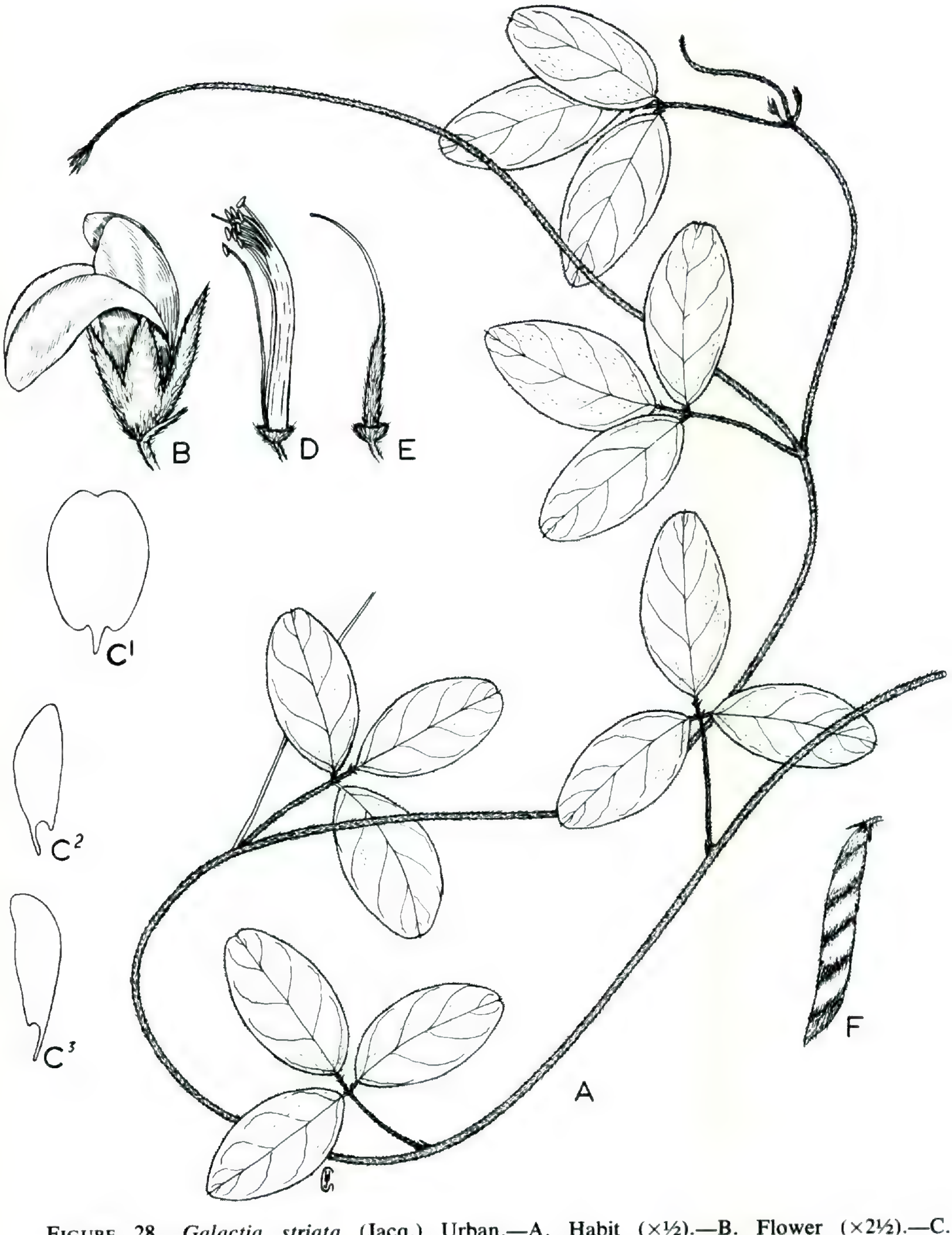

FIGURE 28. *Galactia striata* (Jacq.) Urban.—A. Habit (×½).—B. Flower (×2½).—C. Corolla.—C¹. Standard (×2).—C². Wing petal (×2).—C³. Keel petal (×2).—D. Stamens (×2½).—E. Pistil (×2½). [After *Dressler 1861*.]—F. Fruit (×½). [After *Gaumer 566*.]

long, dark brown and mottled, the hilum short, surrounded by the small light colored, usually caducous aril.

Galactia striata is common in disturbance in lowland Panama, and it ranges from the United States to Argentina and is naturalized in much of the palaeo-

tropics. The small but bright pink flowers are usually seen singly on fencerows and in thickets.

Several varieties have been distinguished in this species, but their identity and variability are not well understood. Much material from Africa and Central America has been known as *Galactia tenuiflora* or *G. striata* var. *tenuiflora*, but this may not represent a distinct taxon.

CANAL ZONE: Pipeline road, 1.2 mi NE of Gamboa gate, *Croat 12735* (MO, NY). Curundú, *D'Arcy 13428* (MO). Albrook Site, U.S. Army Tropic Test Center, *Dwyer 7118* (MO). 0.5 mi W of Summit, *McDaniel 12717* (FSU, MO). Río Agua Salud near Frijoles, *Piper 5149* (US). Red Tank to Pueblo Nuevo, *Piper 5166* (US), *5167* (MO). Cerro Gordo near Culebra, *Standley 26030* (US). Sosa Hill, Balboa, *Standley 26470* (US). Summit, *Standley 26939, 26956, 29617, 30057* (all US). Farfan Beach area, *Tyson 1805* (MO). Howard Air Force Base at Red Devil drop zone, *Tyson 1846* (MO). Curundú, *Tyson 6428* (FSU, MO, SCZ). CHIRIQUÍ: Veradero, 0–100 m, *Burt & Koster 124* (MO). 1 mi W of airport at Puerto Armuelles, sea level, *Croat 21913* (MO). Quebrada Quanabanao, Distrito Guanano, 0–100 m, *Croat 22507* (FSU, MO). DARIÉN: Punta Garachiné, *Duke 10484* (MO, NY). HERRERA: 10 mi S of Ocú, *Tyson et al. 2811* (MO, SCZ). LOS SANTOS: Monagre Beach 5 mi S of Chitré, *Tyson et al. 3009* (GH, MO). PANAMÁ: Without other locality, *Duchassaing 1850* (GH). Beach at Nueva Gorgona, *Duke 4559* (MO). Bella Vista, *Heriberto 227bis* (US); *Killip 12198* (US). San Jose Island, *Johnston 161, 1103* (both GH). San Jose Island, *Johnston 364* (GH, MO, US). Between Savanas and Río Yguana, *Macbride 2650* (F). Bella Vista, *Standley 25301* (US). Taboga Island, *Standley 27972* (US). Between Matías Hernández and Juan Díaz, *Standley 32009* (US). Playa Coronado, *Taylor 85, 186* (both PMA). SAN BLAS: Ailigandí River, *Duke & Bristan 330* (MO). VERAGUAS: Trail between Cañazas and foot of Cordillera Central, 300–600 m, *Allen 192* (US). Puerto Mutis, 12 mi S of Santiago, *Tyson 6002* (FSU, MO, SCZ).

26. GLIRICIDIA

Peter S. White[58]

Gliricidia H.B.K., Nov. Gen. Sp. Pl. 6: (ed. quarto) 393 in nota; (ed. folio) 309 in nota. 1824. TYPE: *Robinia sepium* Jacq. = *Gliricidia sepium* (Jacq.) Walp.

Glyciridia DC., Prodr. 2: 260. 1825. *Gliricidia* H.B.K. orth. mut.
Gliciridia Micheli, Bull. Herb. Boissier 2: 442, *tab. 10*. 1894. *Gliricidia* H.B.K. orth. mut.
Hybosema Harms, Feddes Repert. Spec. Nov. Regni Veg. 19: 66. 1923. TYPE: *H. ehrenbergii* (Schlecht.) Harms = *Gliricidia ehrenbergii* (Schlecht.) Rydb.

Shrubs or medium sized *trees*, unarmed. *Leaves* alternate, sometimes subopposite or opposite, but never exclusively so, odd pinnate; leaflets entire, often drying with purple mottling beneath; estipellate; stipules small, caducous. *Inflorescences* clustered racemes, axillary or cauline, appearing before or with the leaves; bracts inconspicuous, caducous, ebracteolate, pedicels present. *Flowers* often rose or rose tinged; hypanthium distinctively cup shaped, the calyx teeth short and broad or absent; petals 5, about the same length, free except the basally connate keel petals, short clawed, the standard nearly orbicular, erect or reflexed; stamens 10, diadelphous, the odd stamen free, the anthers all the same shape; ovary short stipitate, slender, straight, flattened, glabrous, the ovules several to 10 or more, the style glabrous, about ½ the length of the ovary, the stigma capitate. *Fruit* a dehiscent legume, stipitate, flattened, often wider toward the tip, the margin not or only slightly thickened, not septate and not or only faintly indented between the seeds on the outside, glabrous; the 2 valves hard and often coiling in dehiscence.

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Gliricidia is a genus of 6–9 species of Mexico, Central America, the West Indies, and northern South America. North temperate botanists often remark on its similarity to *Robinia* L. There is also a superficial resemblance to *Lonchocarpus* of the Dalbergieae. *Lonchocarpus* can be distinguished by its indehiscent fruits and the wing petals which are often adherent to the keel petals. *Gliricidia* leaves almost always dry mottled with purple beneath.

The name *Gliricidia* appears to have been taken from Jacquin's (1763) phrase "Glis vel Gliricida" for the common name "Raton vel Mata-Raton" referring to the use of the plant for mouse poison. In first referring to the plant in *Nova Genera et Species,* Kunth spelled the name "Gliricida," but in the footnote where he formally described the genus and in all subsequent usage, including the index to the *Nova Genera et Species,* he spelled the name "Gliricidia," so the spelling "Gliricida" must be taken as a typological variant which Kunth did not intend to use. Cowan's (1959) argument (Taxon 8: 59) that "Gliricida," being more etymologically correct and should be used, is not supported. In Kunth's *Synopsis Plantarum* (1826), published two years after *Nova Genera et Species,* only the spelling "Gliricidia" appears.

Kunth described the genus in a footnote pertaining to *Robinia maculata* H.B.K. (=*R. sepium* Jacq.) and it might be argued that that species should be recognized as the type of the genus. However, Kunth was citing the relationship of *Robinia maculata* H.B.K. to *R. sepium* Jacq. and was referring to the latter in his description.

Literature:

Blohm, H. 1962. Poisonous plants of Venezuela. Stuttgart.
Cowan, R. S. 1959. Leguminosae of the Western Hemisphere. Notes on choices of lectotypes. Taxon 8: 58–60.
Kunth, C. S. 1826. Voyage aux régions équinoctiales du Nouveau Continent, fait en 1799–1804, partie 6. Botanique, sect. 5. Synopsis plantarum. Paris.
Walpers, W. G. 1842. Repertorium botanices systematicae. Leipzig. 1: 679.

1. **Gliricidia sepium** (Jacq.) Walp., Repert. Bot. Syst. 1: 679. 1842.—FIG. 29.

Robinia sepium Jacq., Enum. Pl. Carib. 28. 1760; Sel. Stirp. Amer. 1: 211, 2: *tab. 179, fig. 101.* 1763. TYPE: Colombia, *Jacquin,* not seen. non *Robinia sepium* Sw. (1788).
R. maculata H.B.K., Nov. Gen. Sp. Pl. 6: (ed. quarto) 393, (ed. folio) 309. 1824. TYPE: Mexico, *Humboldt & Bonpland* (P, not seen; microfiche MO).
Lonchocarpus sepium (Jacq.) DC., Prodr. 2: 260. 1825.
L. maculatus (H.B.K.) DC., Prodr. 2: 260. 1825.
Galedupa pungam Blanco, Fl. Filip. (Ed. 1) 558. 1837. TYPE: Philippines, *Blanco,* not seen.
Robinia variegata Schlecht., Linnaea 12: 301. 1838. TYPE: Mexico, *Schiede,* not seen.
Gliricidia maculata (H.B.K.) Walp., Repert. Bot. Syst. 1: 679. 1842.
Millettia luzonensis A. Gray, U.S. Expl. Exped., Bot. 1: 456. 1854. TYPE: Philippines, collector unknown, collection not located.
Gliricidia maculata var. *multijuga* Micheli in Donell Smith, Bot. Gaz. 28: 284. 1895. TYPE: Guatemala, *Hyde & Lux,* D. Smith distrib. no 3296 (US, isotype).
Gliricidia lambii Fern., Bot. Gaz. 20: 533. 1895. TYPE: Mexico, *Lamb 451* (NY, holotype; isotype, GH).
Gliricidia sepium f. *maculata* (H.B.K.) Urb., Symb. Ant. 2: 289. 1900.
Robinia hispida L., Mant. Pl. 101. 1767. pro parte, exclus. type (LINN 913.2, not seen; microfiche MO).

FIGURE 29. *Gliricidia sepium* (Jacq.) Walp.—A. Habit (×½).—B. Flower with one wing petal removed (×1½).—C. Fruit (×½).

Gliricidia sepium (Jacq.) Steud., Nom. Bot., ed. 2, 1: 688. 1840. comb. not valid.
G. maculata (H.B.K.) Steud., Nom. Bot., ed. 2, 1: 688. 1840. comb. not valid.
G. sepium (Jacq.) Griseb., Abh. Königl. Ges. Wiss. Göttingen 7: 52. 1857. Redundant combination.

Trees to 10 m tall with spreading crowns. *Leaves* usually alternate, subopposite or opposite, to ca. 30 cm long; leaflets 5–19, the lateral leaflets mostly opposite, oval to elliptic, 2–7 cm long, 1–3 cm wide, usually glabrous above, sparsely pubescent and lighter beneath, nearly always purple mottled beneath when dry; rachis and petiole lightly to evenly pubescent, petiolules pubescent; stipules minute, caducous. *Inflorescences* conspicuous, preceding the leaves; racemes clustered from branches or older wood and hence the inflorescence appearing compound; individual racemes 4–15 cm long, the flowers borne singly, uniformly distributed along the axis; bracts minute, soon deciduous. *Flowers* pink and lilac to white, the petals usually tinged with yellow toward the base; pedicels 5–10 mm; hypanthium cup shaped, ca. 5 mm long, the calyx teeth low to absent; standard nearly round, erect, ca. 20 mm long, 15–20 mm wide, emarginate, the claw slender, to 5 mm long, the wings oblong, ca. 20 mm long, 5 mm wide, the keel petals ca. 18 mm long, ca. 5 mm wide, coherent at the base;

stamens diadelphous, the tube ca. 12 mm long, 3 mm wide at the base, free filaments alternately long and short; ovary linear, ca. 1 cm long, 1 mm wide, glabrous, the stipe to 5 mm long, the style to ca. 4 mm long, the stigma capitate. *Fruit* light to dark brown, narrow, oblong, ca. 15 cm long, 2 cm wide, the stipe to 1 cm above the persistent cup shaped calyx, margined, surface dull, glabrous, faintly wrinkled or striate; the valves hard, twisting in dehiscence; seeds 3–10, dark brown, nearly round to somewhat oblong, compressed, to 1 cm long.

Gliricidia sepium is native from Mexico to Colombia and in the West Indies. It is also widely cultivated in the New World and was early introduced into the Old World tropics where it has become naturalized, at least in some areas, e.g., the Philippines. It is used as a living fencepost, for hedges, and as a shade tree for cocoa and coffee, although it is less suited to the latter crop since it is leafless for part of the year. The ground bark, leaves, and seeds are used for poisoning rats and mice. The plant is reported to be poisonous to dogs and horses, but cows and goats apparently graze the leaves with no harm (Blohm, 1962). Poultices of the fresh leaves are used to treat skin afflictions. In parts of Central America the flowers are fried and eaten. The species is apparently especially common in the woods and pastures of the Pacific plains in Central America. Common names in Panama are "mata-ratón," and "madre de cacao." (For additional common names and other notes see Standley, 1928.)

In describing the genus *Gliricidia,* Kunth stated that it included *Robinia sepium* Jacq. and *R. maculata* H.B.K., but Kunth did not make the combinations in *Gliricidia*. Steudel's 1840 citation is invalid since he used the names as synonyms of *Lonchocarpus sepium* and *L. maculatus*. Walpers (1842) made valid combinations under *Gliricidia*.

The specific epithet "sepium" is apparently derived from the Latin "saepes" (genitive plural "saepium" or "sepium") meaning "of hedges," which is appropriate since the tree is widely planted as living fenceposts. Thus the epithet does not change in form with gender and the usage in Index Kewensis, Suppl. 13, as "*Robinia sepia*" is in error.

BOCAS DEL TORO: Almirante, *Blum 1349* (FSU, MO, SCZ); *Carleton 155* (US). Almirante, *Cooper 528* (F). Along runway at Bocas, *Lazor et al. 2338* (FSU). Bocas del Toro Island airport, *Lewis et al. 779* (MO). Isla Colón, 0–120 m, *Wedel 505* (GH, MO). Chiriquí Lagoon, *Wedel 1198* (GH, MO, US). Water Valley, *Wedel 2747* (GH, MO, US). CANAL ZONE: Near mouth of Río Chagres, *Allen 871* (F, GH, MO). Near Paraíso, *Croat 13953* (MO). Banks of the Chagres River, below Gatún, near sea level, *Maxon 4838* (US). Ancón, *Piper 5133* (US). Summit Road, *Stern & Chambers 157* (MO, NY, US). Road from Macaracas to Chitré Highway, *Tyson et al. 3151* (MO). Fort Sherman, *Tyson & Blum 3781* (MO). Summit, roadside, *Woodworth & Vestal 477* (F, GH). CHIRIQUÍ: 1.6 mi W of Puerto Armuelles, 50 m, *Croat 21927* (DUKE, left-hand specimen; MO, right-hand specimen). Boquete, 3300–4200 ft, *Lewis et al. 393* (MO). 2 km NE of Remedios, 15 m, *Nee 10124* (MO, US, WIS). COLÓN: Puerto Pilón, *Correa & Dressler 1191* (DUKE). Penonomé, 50–1000 ft, *Williams 341* (NY). DARIÉN: El Real along trail to Río Pirre, *Stern et al. 289* (GH, MO, US). HERRERA: Paris de Parita, *Carrasquilla 173* (DUKE, MO). Outskirts of Chitré, *Stern et al. 1230* (GH, MO, US). Las Minas, along Río Las Trancas, *Stern et al. 33625* (MO). 4 mi S of Los Pozos, *Tyson 2701* (FSU, MO, US). 5 mi S of Pesé, *Tyson et al. 2886* (MO, SCZ). LOS SANTOS: El Ejido de Los Santos, *Lao 88* (DUKE, MO). Road from Macaracas to Chitré Highway, *Tyson et al. 3151* (FSU, SCZ). PANAMÁ: Panama Viejo, *Dodge 17517* (GH, MO). Taboga Island, *Dwyer 2812* (FSU), *2872, 4467* (both MO). Bellevista, *MacBride 2759* (F, US). Taboguilla Island, *Miller 1983* (US). Roadside between Chepo and Río Bayano, *Porter et al. 5176* (MO, SCZ). Taboga Island, *Standley 27076, 27857* (both US). SAN BLAS: *Duke 10179* (MO, OS). VERAGUAS: Santiago, *Allen 1077* (MO). Soná, *Allen 4261* (MO, US). Cañazas, *Tyson 3608, 3626* (both MO). 2 mi S of Cañazas, *Tyson 3723* (FSU, MO, SCZ).

27. INDIGOFERA

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Indigofera L.,[60] Sp. Pl. 751. 1753; Gen. Pl., (ed. 5) 333. 1754. LECTOTYPE: *Indigofera tinctoria* L. (India).

Anil Mill., Gard. Dict. Abr., ed. 4. 1754. TYPE: *Anil, sive Indigo Americana, siliquis* . . . Mill. = *Indigofera tinctoria* L.
Anil(a) Kuntze, Rev. Gen. Pl. 1: 159. 2: 938, 965. 1891. Based on *Indigofera* L.

Herbs or *shrubs*; more or less strigose with pale appressed hairs attached by their centers, these hairs often lending a gray green appearance to the plant. *Leaves* imparipinnate or pinnately or digitately 3-foliolate, less commonly simple; usually short-petioled; leaflets entire, venation, except for the midvein, obscure; stipels present, often inconspicuous; stipules setaceous, deciduous, apparently slightly adnate to the petioles. *Inflorescence* of axillary racemes or spikes, often dense, pedicels short or apparently absent, the flowers single in the axil of a caducous bract, the bracteoles absent. *Flowers* usually reddish or white, the hypanthium campanulate, the 5 calyx lobes subequal, corolla more or less pubescent outside, the standard broad, circular, subsessile, strigose outside, the wing petals oblong, somewhat adherent to the keel, auriculate, the keel petals coherent, laterally spurred; stamens 10, diadelphous, the vexillary stamen free, the sheath slender, the anthers with an apical projection; ovary slender, sessile, few to many ovulate, usually strigose, the style short, bent upward, glabrous, the stigma capitate. *Fruits* oblong or linear, rarely globose, curved or straight, usually terete or 4-angled, not usually compressed, dehiscent or apparently indehiscent, septate between the seeds; seeds globose to cylindric and truncate, compressed or 4-angled, attached at the middle.

Indigofera is a genus of some 800 species in the warmer to tropical regions of both the New and Old Worlds and is particularly diverse in Africa. About 10 species occur in Central America, of which 4 are native in Panama. The Old World species *Indigofera tinctoria* L., formerly in cultivation in Central America, is perhaps to be looked for in Panama as persistent on old sites of cultivation. It has become naturalized in the West Indies (Rydberg, 1923) but apparently has not spread much from cultivation in Central America (Standley and Steyermark, 1946). *Indigofera tinctoria* L. resembles *I. suffruticosa* Mill. (described below) but has pods straight or slightly curved, 6–12 seeded, and 2–4 cm long.

The 4 species in Panama, weeds in the dry zones of the country, are easily recognized due to their gray green cast which results from pale, appressed, medifixed hairs. Additional unusual characters are the appendaged anthers and septate legumes. There is a tendency for *Indigofera* species to darken on drying. The flowers are "slightly explosive," the stamens and pistil being under some tension within the keel petals and springing outward when the petals are parted.

Indigofera was formerly economically important as the source of the blue dye indigo. Before the cultivation of coffee, this was the most important export crop

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[60] For additional generic synonymy see Hutchinson, 1967.

of Central America. Indigo is no longer extracted from the plant, synthetic dyes having supplanted the natural source. The final decline of the industry was probably in the mid- to late 1800's. The extraction procedure exposed workers to toxic chemicals (Standley, 1928). Cut plants were fermented in vats of water, after which they were trampled by the workers. Eventually the indigo settled to the bottom of the vats as a precipitate (Standley, 1928; Standley and Steyermark, 1946; see also colorful accounts in Miller, 1768, and Lunan, 1814, and also the references cited in Taylor, 1976). The most important species for indigo manufacture in Central America were the native *Indigofera suffruticosa* and the introduced *I. tinctoria*.

Indigofera species apparently contain compounds with medicinal properties (Blohm, 1962; Standley and Steyermark, 1946), but medicines prepared from the plants can also have poisonous effects (Blohm, 1962). The seeds of several species are said to be poisonous. In Brazil, the roots of *Indigofera lespedezioides* H.B.K. and *I. suffruticosa* were used as fish poisons; the macerated roots were also used as an insecticide (Miller, 1768; Lunan, 1814; Blohm, 1962).

Literature:

Blohm, H. 1962. Poisonous plants of Venezuela. Stuttgart.
Lunan, J. 1814. Hortus jamaicensis. Vol. 1. Jamaica. 538 pp.
Miller, P. 1768. Gardener's Dictionary, edition 8.

a. Leaflets 7–19, the fruits either strongly constricted between the seeds or strongly curved.
  b. Fruits straight or slightly curved and strongly constricted between the seeds ---------- 3. *I. panamensis*
  bb. Fruits strongly curved, not constricted between the seeds ---------- 4. *I. suffruticosa*
aa. Leaflets 1–7, the fruits neither strongly constricted between the seeds nor strongly curved.
  c. Erect plant, leaves 1–5(–7) foliolate, the leaflets ascending, widest toward tip, cuneate at base, fruits 12–20 mm long ---------- 2. *I. lespedezioides*
  cc. Sprawling or suberect plant, leaves 5(–7) foliolate, the leaflets not ascending, widest near the middle, rounded at base, fruits (20–)25–35 mm long ---------- 1. *I. jamaicensis*

1. **Indigofera jamaicensis** Spreng., Syst. Veg., (ed. 16) 3: 277. 1826. TYPE: Jamaica, *Bertero* (?TO, not seen).—FIG. 30A–C.

I. flaccida Koenig ex Roxb., Hort. Beng. 98. 1814 (without description); *In* W. Carey, ed., Fl. Indica, (ed. 2) 3: 375. 1832. TYPE: India, not seen. (fide Rydberg 1923.)

I. mucronata Spreng. ex DC., Prodr. 2: 227. 1825. TYPE: Jamaica, *Bertero* (TO, not seen); probably the same collection as cited for *I. jamaicensis* Spreng. Non *Indigofera mucronata* Lam., Encycl. Méth. Bot. 3: 247. 1789. TYPE: South Africa (P-JU, not seen; microfiche MO) = *Indigofera cytisoides* L., Mant. 2: 271, in nota. 1771. Nor *Indigofera mucronata* Willd. ex Spreng., Syst. Veg., (ed. 16) 3: 276. 1826. in syn. = *Indigofera lespedezioides* H.B.K., Nov. Gen. Sp. Pl. 6: 457, (ed. quarto). 1824. An *Indigofera mucronata* Sesse & Moc., Fl. Mex., (ed. 1) 189, 190. 1887, (ed. 2) 173, 174. 1894. TYPE: Mexico, not seen.

I. lespedezioides sensu Hook. & Arn., Bot. Beech. Voy. 415. 1840. Non *Indigofera lespedezioides* H.B.K., Nov. Gen. Sp. Pl. 6: 457, (ed. quarto). 1824.

I. heterophylla Presl., Abh. Böhm. Ges. Wiss. 3: 485. 1844. Bot. Bemerk. 55. 1844. TYPE: Mexico, not seen. (fide Rydberg 1923.) Not *Indigofera heterophylla* Thunb., Prodr. Pl. Cap. 133. 1800. TYPE: South Africa, not seen. Nor *Indigofera heterophylla* Roxb. ex Wight & Arn., Prodr. 200, 201. 1834. TYPE: India, not seen.

I. subulata sensu Griseb., Fl. Brit. W.I. 181. 1859, et alia auct. Non *Indigofera subulata* Vahl. ex Poir., Encycl. Suppl. 3: 150. 1813. TYPE: Guinea (P-JU, not seen; microfiche MO).

I. tephrosioides sensu Micheli, Bull. Soc. Roy. Bot. Belgique 30: 286. 1891. Non *Indigofera tephro-*

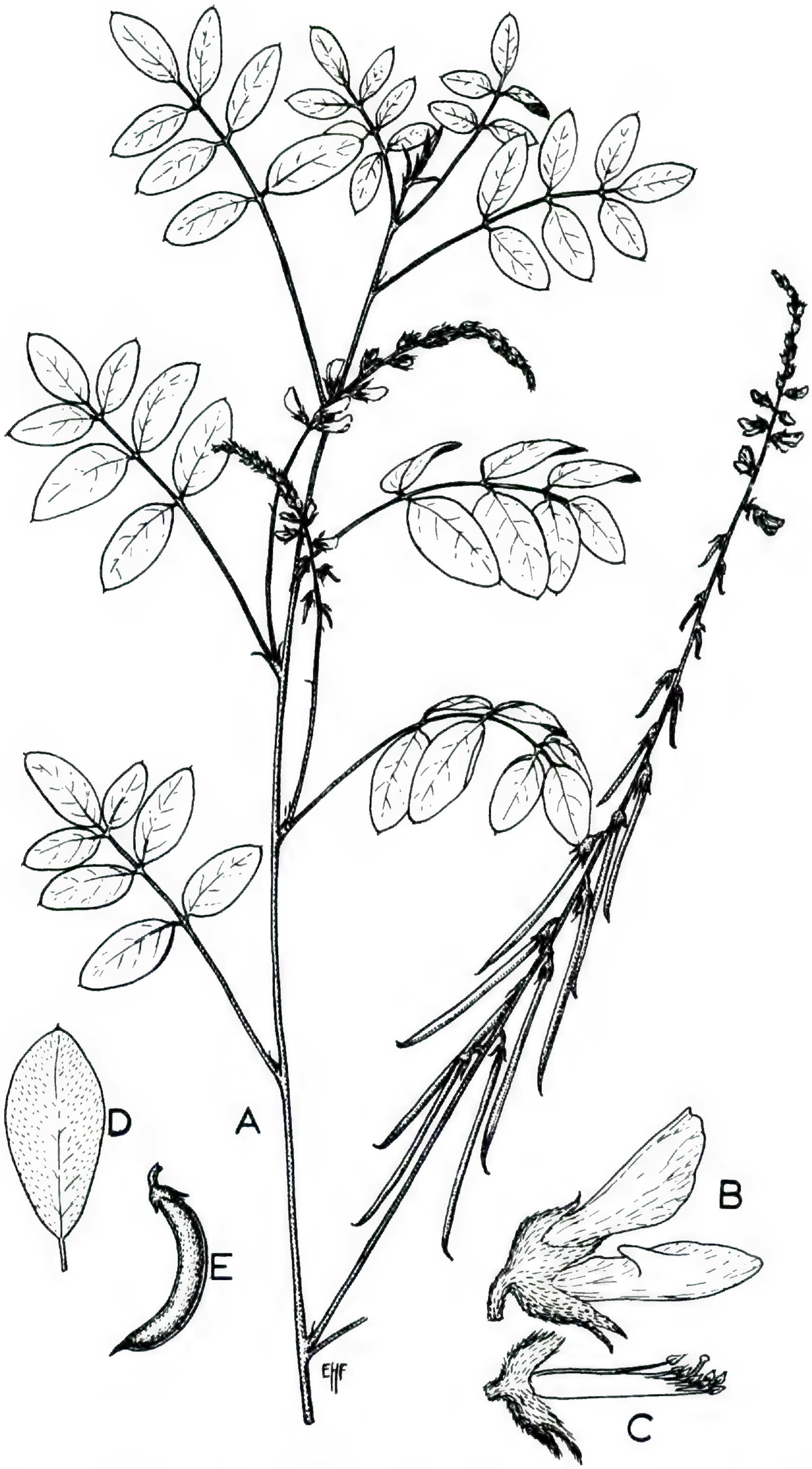

FIGURE 30. *Indigofera*.—A–C. *Indigofera jamaicensis* Spreng.—A. Habit (×¾).—B. Flower (×3¾).—C. Flower with corolla removed (×6).—D–E. *Indigofera suffruticosa* Mill.—D. Leaf (×1½).—F. Fruit (×1½).

sioides H.B.K., Nov. Gen. Sp. Pl. 6: 455, (ed. quarto). *tab. 580.* 1824. TYPE: Ecuador (B, not seen; photo MO).

I. macilenta Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 22: 26. 1940. TYPE: Mexico, *Gentry 2335* (holotype F; isotypes GH, MO, US).

Perennial *herbs* or *shrubs*, trailing, sprawling, or suberect, the branches ridged in narrow lines from the nodes when young, strigose to glabrate. *Leaves* 5(–7) foliolate; leaflets broadly elliptic to ovate, when mature ca. 18–25 mm long, 8–12 mm wide, rounded apically, mucronate, rounded basally, strigose, the petiolules ca. 1.0–1.2 mm long; petioles ca. 15–18 mm long; rachis 2–3 cm long; stipels apparently absent, perhaps represented by tufts of brown hairs at the rachis nodes; stipules setaceous, ca. 2 mm long. *Inflorescence* of relatively lax and open axillary racemes 6–12 or more cm long, in fruit (8–)15(–18) cm long, nodes ca. 40, not all bearing mature flowers or fruits; flowering pedicels ca. 1 mm long; fruiting pedicels recurved, ca. 1.5 mm long; bracts narrowly triangular, 1 mm long. *Flowers* reddish, 5–6 mm long, the hypanthium cup broadly campanulate, ca. 1.5 mm long, the 5 subequal teeth triangular tapering acuminately to bristlelike tips, 2 mm long; petals subequal, the standard obovate with cuneate base, ca. 5 mm long, 3–4 mm wide, with scattered hairs outside, the wings 4.5 mm long, the blade oblong elliptic, narrower basal part ca. 2 mm long, auriculate, the keel petals fused, obovate, 5 mm long, narrowed to free cuneate bases ca. 1.5 mm long; staminal sheath ca. 3 mm long, the anthers ca. 0.5 mm long; ovary linear, ca. 3 mm long, the style upcurved, 1 mm long, the stigma capitate. *Fruits* linear, straight or slightly curved, (20–)25–35 mm long, angled, not narrowed above the remnants of the calyx, strigose, strongly reflexed on recurved pedicels, 12–15-seeded; seeds oblong to subreniform, ca. 2 mm long, 0.8 mm wide, light brown, smooth, dull.

Indigofera jamaicensis Spreng. is found from southern Mexico to Colombia and Venezuela and also in the West Indies. It has been introduced and is apparently established in parts of the Old World tropics. It is a weedy plant, low or suberect and apparently often leaning on or clambering over other plants. It is common in the drier parts of Central America. It is called "anilillo" in Mexico and Guatemala (Standley & Steyermark, 1946).

The names *Indigofera mucronata* Spreng. ex DC. and *I. subulata* Vahl ex Poir. have both been much in use for this species, while the name *I. jamaicensis* Spreng. has been ignored. In publishing *Indigofera mucronata* in 1825, de Candolle attributed the name to "Spreng. in Herb. Balb." Following the description, he indicated the collector (Bertero) and the type locale (Jamaica). De Candolle apparently was unaware of the earlier *I. mucronata* Lamarck (1789) for a South African plant not resembling the New World plant in question. In the year after de Candolle's publication, Sprengel seems to have recognized this problem. He cited *Indigofera mucronata* Lam. as a synonym of *I. cytisoides* L. and published a new name, *Indigofera jamaicensis* Spreng., for the Bertero collection from Jamaica. His description is close to that of *I. mucronata* Spreng. ex DC., and it is likely that they are based on the same collection.

Indigofera subulata Vahl ex Poir. (1813) has also been widely used for this species. It is based on a plant from Guinea described as having 1–3-foliolate leaves. A collection in P-JU (microfiche, MO) bearing the legend "*Indigofera*

subulata Vahl. Guinea. 1804'' would seem to be the type. It is predominantly 3-foliolate and is clearly not the New World plant under consideration here. In de Candolle's text under *Indigofera subulata* Vahl ex Poir. he dropped Poiret's reference to unifoliolate leaves and cited ''*Indigofera mucronata* Spreng.,'' although several pages later he described a separate *I. mucronata* Spreng. ex DC. Similarly, under the description of *I. mucronata* Spreng. ex DC., he states ''Valde accedit ad *I. subulatum* sed folia bi nec unijuga.'' This relating of an Old and New World plant and de Candolle's ignorance of *I. mucronata* Lam. would seem to be the source of the confusion.

BOCAS DEL TORO: Almirante, *Barrus 405* (GH). Changuinola to 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 819* (GH, MO). CANAL ZONE: Corozal to Pedro Miguel, *Cowell 396* (NY). Road to Radar Station, 1 mi N of Summit Garden, *Croat 12651* (MO, NY). Summit Naval Radio Station, *Croat 14242* (MO). Telephone trail between Río Indio Hydrographic Station and natural bridge of Río Puente, *Dodge & Allen 17476* (GH, MO). Fort Kobbe, *Dwyer 3029A* (MO). Near Fort Clayton, *Greenman & Greenman 5186* (DUKE, MO). Camino de Corozal, *Heriberto 275* (NY, US). Las Cruces Trail, 75 m, *Hunter & Allen 741* (MO). Frijoles railroad tracks, *Killip 3372* (NY, US). 2 mi N of Paraíso on road to Colon, *Lazor & Blum 5322* (FSU). Madden Dam, 50 ft, *Lewis et al. 26* (GH, MO, US). La Boca, *Mori & Kallunki 3682* (MO). Chiva-Chiva Trail, red tank to Pueblo Nuevo, *Piper 5108* (US). Gamboa, *Piper 5115* (US). Empire to Mandinga, *Piper 5135* (US). Río Grande near Culebra, 50–100 m, *Pittier 2113* (NY, US). Gamboa, 20–100 m, *Pittier 4786* (NY, US). Donato Trail, Barro Colorado Island, *Shattuck 562* (MO). Las Cascadas Plantation, near Summit, *Standley 25770* (US). Frijoles, *Standley 27639* (US). Gamboa, *Standley 28356* (US). Obispo, *Standley 31779* (US). 1 mi N of Summit Garden, *Tyson & Blum 1989* (DUKE, MO, SCZ). 1 mi N of Summit on road to FAA radar tower, *Tyson et al. 2753, 2759* (both MO). Fort San Lorenzo, *Tyson & Blum 3691* (FSU, MO). Albrook Air Force Base, E end of air strip, *Tyson & Lazor 6014* (FSU). Curundú, *Tyson & Lazor 6112* (FSU). CHIRIQUÍ: Frontera, 100–200 m, *Burt & Koster 146* (MO). Rabo de Puerco, 150 m, *Busey 448* (MO). Boquete, *Davidson 795* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 249* (MO). Monte Verde, 80 m, *Liesner 21* (MO). Quebrada Melliza, 0–150 m, *Liesner 497* (MO). COCLÉ: El Valle, 582 m, *Burt & Rattray 33* (MO). COLON: Juan Mina plantation, Río Chagres above Gamboa, 25 m, *Allen 4116* (MO). 4 km E of Buena Vista, 3 km N of cement plant, road to Sardinilla, 85 m, *Nee 7793* (MO). DARIÉN: *MacBride 2705* (F, MO, US). HERRERA: 10 mi S of Ocú, *Tyson et al.* (MO, SCZ). ½ mi N of Macaracas on Río La Villa, *Tyson et al. 3141* (MO, SCZ). LOS SANTOS: Chitré-Las Tablas, 0–100 m, *Burt & Rattray 51* (MO). Headwaters of Río Pedregal, 25 mi SW of Tonosí, 2500–3000 ft, *Lewis et al. 2981* (MO). Between Tonosí and Macaracas, *Oliver et al. 3540* (MO). 12 mi S of Macaracas, *Tyson et al. 2928* (MO, SCZ). PANAMÁ: Road to El Valle close to Interamericano, 0–100 m, *Burt & Rattray 37* (MO). Bayano Dam, *D'Arcy 9424* (MO). Airstrip near beach, Panama City, *Duke 4007* (MO). El Llano, *Duke 5855* (MO). Río Pacora just below confluence with Río Corso, *Duke 12020* (MO). Río Pasiga, *Gentry 2379* (MO). 1 mi N of Goofy Lake, *Oliver et al. 2685* (MO). Agricultural Experiment Station at Matías Hernández, *Pittier 6895* (GH, NY). Matías Hernández, *Sosa* (F). Bella Vista, *Standley 25330* (US). Corozal Road near Panamá, *Standley 26818* (US). Cerro Azul, 2000 ft, *Tyson 2058* (MO, SCZ), *2133* (MO), *2143* (FSU, MO, SCZ). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 72* (MO). Atalaya-Santiago, 100–200 m, *Koster 115* (MO). Puerto Mutis, 12 mi S of Santiago, *Tyson 6012* (FSU, SCZ).

2. **Indigofera lespedezioides** H.B.K., Nov. Gen. Sp. Pl. 6: 457 (ed. quarto). 1824. TYPE: Mexico (P, not seen; microfiche, MO).

I. grisea Desv., Ann. Sci. Nat. (Paris) 9: 410. 1826. TYPE: ''Hab. in Para.,'' (?P, ?PC, not seen).

I. humboldtiana Spreng., Syst. Veg. (ed. 16) 3: 276. 1826. TYPE: Mexico (holotype, P, not seen; microfiche, MO; paratype, B, not seen; microfiche, MO).

I. mucronata Willd. ex Spreng., in syn., Syst. Veg. (ed. 16) 3: 276. 1826. Non *Indigofera mucronata* Lam., Encycl. Méth. Bot. 3: 247. 1789. Nor *Indigofera mucronata* Spreng. ex DC., Prodr. 2: 227. 1825. An *Indigofera mucronata* Sesse & Moc., Fl. Mex. (ed. 1) 189, 190. 1887. (ed. 2) 173, 174. 1894.

I. pascuorum Benth., Ann. Nat. Hist. Ser. 1. 3: 431. 1839. TYPE: British Guiana, *Schomburgk 96* (G, not seen; photo, MO).

I. pohliana Benth., Ann. Nat. Hist. Ser. 1. 3: 431. 1839. TYPE: Brazil, *Pohl* (PR, not seen).

Anila lespedezioides (H.B.K.) Kuntze, Rev. Gen. Pl. 160. 1891.

Indigofera acasonicae Brandegee, Univ. Calif. Publ. Bot. 7: 326. 1920. TYPE: Mexico, *Purpus 8510* (holotype, UC, not seen; isotypes, GH, MO).

Perennial *herbs* or *shrubs*, stems not much branched, at least above, stiffly erect, appressed strigose, ridged in narrow lines from the nodes when young, later terete, base stout and woody, the whole plant strigose. *Leaves* ascending, (1–)3–5(–7) foliolate, typically simple below and compound above; leaflets cuneate at the base, widest toward the tip, mucronate, the largest simple leaflets to 28 mm long, 8 mm wide, other leaflets averaging 20 mm long, 6 mm wide, the smallest 10 mm long, 1.8 mm wide; petiolules to 1 mm long; petioles 1–3 mm long, rachis 3–15 mm long, stipels setaceous, inconspicuous, less than 1 mm long, stipules narrow triangular, acuminate, ca. 3 mm long. *Inflorescence* of axillary racemes, as long as or longer than the leaves when in full bloom or fruit, the axis to 4 cm long, the nodes 10–30, not all bearing mature flowers or fruits; pedicels single in the axils of narrow triangular caducous bracts, pubescent; bracts to 3 mm long. *Flowers* with pink or ?yellow corolla, 4–6 mm long, the hypanthium 2–3 mm long including the triangular teeth, campanulate, pubescent, teeth about equal to the cup, the lower longer than the upper; standard circular, ca. 5 mm long, short clawed, the wing petals oblong, ca. 5 mm long, to 1.5 mm wide, the claw about equal to the blade, the keel petals narrowly oblong, ca. 5 mm long, to 1.5 mm wide, the staminal sheath linear; pistil linear, pubescent, the style 2–3 mm long, the stigma capitate. *Fruits* reflexed, linear, 12–20 mm long, 1.7–2.0 mm wide, beaked with persistent style base 1 mm long, 2-valved, the valves only slightly twisted on dehiscence, pubescent outside, septate within, 7–10 seeded, the calyx remnants persistent at the base, nonstipitate, fruiting pedicels 1–2 mm long; seeds oblong or subreniform, 1.5 mm long, dull brown, smooth.

Indigofera lespedezioides is found from southern Mexico southward to Bolivia and Brazil and also in the Greater Antilles. The plant is distinctive among Panamanian species because of its leaves, the lower ones unifoliolate, and all leaflets ascending, short petiolate, and widest toward the tip, and its short, straight legumes which are usually densely pubescent.

The original description of this species fails to mention the occurrence of unifoliolate and trifoliolate leaves that are so distinctive and conspicuous on Panamanian collections. This is perhaps explained by the fact that the type collection (P; microfiche, MO) appears to be the upper ½ of a stem, the unifoliolate and trifoliolate leaves being more common in this species on the lower parts of the stem. However, there are some flowering and fruiting collections from Panama which have unifoliolate leaves to at least the base of the inflorescence. A fruiting collection in the Willdenow Herbarium (B, not seen; microfiche, MO) is clearly conspecific with the Panamanian material. This is one of two sheets cited by Sprengel in his description of *Indigofera humboldtiana* Spreng. (=*Indigofera lespedezioides* H.B.K.), the other being the type of *I. lespedezioides* itself. This strengthens the case for using the name *I. lespedezioides* for the Panamanian material.

CANAL ZONE: Las Cruces Trail, between Fort Clayton and Corozal, *Standley 29187* (US). Las Sabanas, *Zetek* (MO). CHIRIQUÍ: Boquete, 4000 ft, *Davidson 748* (F, GH, MO, US). COCLÉ: E of Río Teta and Interamerican Highway, *Blum & Tyson 1880* (SCZ). Near Santa Clara Beach, *Croat 9602* (MO). 4–6 mi E of Natá, 10–25 m, *Duke 12391* (MO). Penonomé, *Ebinger 1027* (MO). Picacho de

Olá, 350–600 m, *Pittier 5067* (NY, US). Between Penomomé and Coclé, *Stern et al. 980* (MO). Penonomé, 50–1000 ft, *Williams 604* (NY, US). HERRERA: Near Chupampa, 0–100 m, *Burt & Koster 85* (MO). PANAMÁ: Pacora, 35 m, *Allen 1000* (MO, US). Chepo, 0–100 m, *Burt & Rattray 15* (MO). Pacora, 0–100 m, *Burt & Rattray 20* (MO). Río Pacora, Chepo Highway, *Duke 5907* (MO). Río Mar, 5–20 m, *Duke 12420* (MO, NY). Las Sabanas, *Heriberto 139* (NY); *Standley 25929* (MO, US). Between Las Sabanas and Matías Hernández, *Standley 31854* (US). 1.5 km del Río Cabra, camino a Chepo, *Taylor* (DUKE, F, MO). Pacora, 25 m, *Woodson et al. 732* (GH, MO, US). Between Pacora and Chepo, ca. 25 m, *Woodson et al. 1664* (GH, MO, NY, US).

3. **Indigofera panamensis** Rydb., N. Amer. Flora 24: 147. 1923. TYPE: Panama, *Williams 123* (NY).

Shrub to 2.5 m, much branched, the stems ascending, slender, slightly lined from the nodes when young, later terete, whole plant strigose with appressed medifixed hairs. *Leaves* (7–)11–15(–19) foliolate, leaflets narrowly elliptic to obovate, rounded at the apex, mucronate, rounded or broadly cuneate at the base, lowermost leaflets smaller than the terminal ones, 10 mm long, 3 mm wide, the largest leaflets 24 mm long, 8 mm wide, the middle leaflets typically ca. 15–17 mm long, 5–7 mm wide, strigose, greener and less densely hairy above; petiolule 1.5 mm long, the petiole 5–10 mm long, the rachis 3.0–4.5(–6.0) cm long; stipels setaceous, inconspicuous, 0.5–0.75 mm long; stipules setaceous, inconspicuous, ca. 1 mm long. *Inflorescences* of dense axillary racemes ca. 4 cm long, to 5 cm long in fruit, thus shorter than the largest mature leaves, the nodes ca. 40–70 but not all with mature flowers or fruits; pedicels single, ca. 1 mm long, recurved in fruit; bracts small, inconspicuous, setaceous, barely 1 mm long, early deciduous. *Flowers* dull red, ca. 5 mm long, the hypanthium campanulate, ca. 1.25 mm long, the 5 teeth subequal, triangular, ca. 0.5 mm long, strigose; petals subequal, the standard obovate, narrowed to cuneate base, 4.5 mm long, hairy outside, the wing petals with blade narrow elliptic, ca. 3.5 mm long, tapered to the claw, ca. 1.0–1.5 mm long, auriculate at the base, the keel petals fused above, obovate, ca. 4 mm long, narrowed to the free clawed bases; staminal sheath ca. 2 mm long, the anthers ca. 0.5–0.75 mm long; pistil ca. 3.5 mm long, scattered hairy, ovary linear, the style upcurved, ca. 1 mm long; stigma capitate. *Fruits* straight or slightly curved, 15–20 mm long, strongly constricted between the seeds, ca. 1 mm wide between the seeds, 2 mm wide at the seeds, tapering to a slender beak 1–2(–3) mm long, tapering basally to a narrowed portion 1–2 mm long above the persistent remnants of the calyx cup, (2–)3–4 seeded; seeds oblong to subreniform, 2–3 mm long, 1.0–1.5 mm wide, smooth, dull, brown.

Indigofera panamensis Rydb. is endemic to Panama where it is known from three provinces on the Pacific side of the country. It is found primarily in dry to moist climatic areas in fairly open vegetation such as forest edges, roadside disturbed areas, and brushy slopes. This species is readily recognized when in fruit: the fruits are 3–4 seeded, more or less straight, and strongly constricted between the seeds, thus bringing to mind short strings of beads. If the similarity of leaves and flowers is any indication, the plant is closely related to *Indigofera suffruticosa* Mill. The fruits of the latter species also provide easy identification: they are strongly curved, not constricted between the seeds, and resemble miniature bananas. However, when in leaf or flower, the separation of these two species proves more difficult. *Indigofera suffruticosa* Mill. tends to have larger leaflets,

longer stipules, and longer bracts. The problem with leaflet size is, of course, that leaves enlarge as they mature. Herbarium sheets may thus be inconclusive as to mature leaflet size. The bracts are early deciduous in both *Indigofera panamensis* and *I. suffruticosa*; and, in fact, stipules may be difficult to find as well. The two species both have stems lined from the nodes when young; these lines are seemingly more persistent on *I. suffruticosa* stems than on *I. panamensis* stems with age. The older stems of *I. suffruticosa* are thus noticeably to obscurely angled in cross section.

CANAL ZONE: TTC Albrook Tower out C-15 road, *Blum & Dwyer 2160* (FSU, MO, SCZ). Chiva-Chiva Trail red tank to Pueblo Nuevo, *Piper 5109* (US). Chiva-Chiva Road, *Smith & Smith 3339* (F, MO, NY). Sosa Hill, Balboa, *Standley 25266* (GH, US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29227* (GH, US). Curundú, road past Survival School, *Tyson 3473* (FSU, MO, SCZ). COCLÉ: 1.5 mi below El Copé, *McDaniel & Cooke 14781* (FSU, MO). Penonomé, 50–1000 ft, *Williams 123* (NY). HERRERA: 4 mi S of Los Pozos, *Tyson 2696* (FSU, MO, SCZ).

4. **Indigofera suffruticosa** Mill., Gard. Dict., (ed. 8). *Indigofera* no. 2. 1768. Based on "*Colutea affinis fruticosa argentea* . . . ," Sloane, Cat. Jam. 142. 1696.—FIG. 30D–E.

I. tinctoria Mill., Gard. Dict., (ed. 8). *Indigofera* no. 1. 1768. Not *I. tinctoria* L., Sp. Pl. 751. 1753.
I. anil L., Mant. 272. 1771. TYPE: "Habitat in India," not seen.
I. divaricata Jacq., Hort. Schoenb. *pl. 365*. 1798. TYPE: not located.
I. guatimala Lunan, Hort. Jam. 420. 1814. Based on: "*Assurgens minusque divisa* . . . ," P. Br., Civ. Nat. Hist. Jam. 302. 1756.
Indigofera tinctoria var. *brachycarpa* DC., Prodr. 2: 224. 1825. pro parte (fide Rydberg 1923). TYPE: a plant cultivated in Europe, not seen.
Indigofera anil var. *polyphylla* DC., Prodr. 2: 225. 1825. TYPE: Santo Domingo, not seen.
I. comezuelo Moc. & Sesse ex DC., Prodr. 2: 225. 1825. in syn.
I. drepanocarpa Berg., in Berg. & Schmidt, Darst. Offiz. Gew. 4: 30d. 1863. (pro parte fide Rydberg 1923.)
Anila tinctoria var. *vera* Kuntze, Rev. Gen. Pl. 160. 1891. TYPE: St. Thomas (NY).

Perennial *herbs* or *shrubs* to 3 m tall, much branched, the branches lined and angled from the nodes when young, later more faintly lined and angled to nearly terete; whole plant strigose with pale medifixed hairs. *Leaves* (9–)13(–17) foliolate, the leaflets elliptic to obovate, rounded apically, mucronate, acute basally, the terminal leaflets largest, to 40 mm long, 15 mm wide, the smaller mature leaflets to 15 mm long, 5 mm wide, average leaflets ca. 30 mm long, 7 mm wide, strigose above, pubescence denser and leaflets paler beneath; petioles to 2.5 cm long, petiolules 1–2 mm long; rachis typically 6–8(–12) cm long; stipels inconspicuous, setaceous, to 0.8 mm long; stipules inconspicuous, setaceous, 2–3 mm long. *Inflorescence* of dense axillary racemes ca. 3–4 cm long, the axis somewhat longer in fruit, to 5 cm long, thus shorter than the leaves, nodes ca. 40–70 but not all with mature flowers or fruits; pedicels single, recurved, just under 1 mm long in flower, just exceeding 1 mm long in fruit; bracts setaceous, early deciduous, to 2 mm long. *Flowers* rust red, to ca. 4 mm long, with the hypanthium campanulate, ca. 1.5 mm long, the cup 1 mm long, the subequal deltoid teeth ca. 0.5 mm long, strigose; petals subequal, the standard 3–4 mm long, densely hairy outside, obovate, the wings oblong, the claws to 0.8 mm long, auriculate, the keel petals fused, obovate, densely hairy outside; staminal sheath linear, ca. 2 mm long, the anthers ca. 0.5 mm long; ovary linear, the style upcurved, the

stigma capitate. *Fruits* to 15 mm long, ca. 2.2 mm in diameter, strongly curved and resembling miniature bananas, the slender beak 1–2 mm long, not narrowed above persistent remnants of the calyx cup; seeds (3–)5–6(–7), rectangular angled, at least when dry, ca. 1.5 mm long, 1 mm wide, dull, brown, smooth.

Indigofera suffruticosa is found from South Carolina, Florida and Texas southward to Bolivia and Argentina, and also in the Bermudas and the West Indies. It is naturalized in tropical Africa, Asia, and Australia. It is common in the drier parts of Central America. The fruits of *I. suffruticosa* are strongly curved and resemble miniature bunches of bananas. *Indigofera suffruticosa* is apparently related to the Old World *I. tinctoria,* which has also become established or is at least persistent after cultivation in parts of the New World tropics. Differences with *I. panamensis* have been discussed under that species.

Indigofera suffruticosa is the most important species as a source of indigo dye in the New World tropics (see discussion above). Common names are "anil" (for indigo dye) and "jiquelite" for the plant (Standley, 1928).

Without location, *Hayes 298* (NY). BOCAS DEL TORO: Changuinola, *Godfrey 67326* (FSU, MO). Runway, Bocas, *Lazor et al. 2344* (FSU, MO, SCZ). Changuinola, 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 790* (GH, MO, US). Chiriquicito, 5 mi S along Río Guarumo, *Lewis et al. 1967* (GH, US). Almirante, *McDaniel 5116* (FSU, MO); *Wedel 414* (GH, MO). Chiriquí Lagoon, *Wedel 1175* (GH, MO, US). Shepherd Island, *Wedel 2719* (GH, MO, US). CANAL ZONE: Farfan Beach, *Blum & Godfrey 1679* (DUKE, FSU). Venado Beach, *Correa & Gonzalez 501* (GH, MO, SCZ), *505* (DUKE). Farfan Beach, *Dwyer 11959* (MO). Chagres, in the old fort, *Hayes 355* (NY). Madden Road, 80–110 m, *Nee 7613* (MO). Old Fort Lorenzo, mouth of Rio Chagres, *Piper 5970* (US). Balboa, *Standley 25568* (US). Corozal, *Standley 27395* (US). Gamboa, *Standley 28464* (US). Fort Randolph, *Standley 28746* (MO, US). Río Pedro Miguel, near East Paraíso, *Standley 30035* (US). Balboa, *Standley 32145* (GH, US). Curundú, near Tropic Survival School, *Tyson & Blum 2525* (FSU, MO). Pipeline Road, *Wilbur & Weaver 11231* (DUKE, MO). Playa Venado, *Wilbur & Teeri 12976* (DUKE, F, GH, MO, NY). CHIRIQUÍ: Quebrada Punta de Piedra, 0–100 m, *Croat 22462* (MO). 2 mi S of Puerto Armuelles, *Wilbur et al. 13576* (DUKE, MO). 6 mi W of San Lorenzo, *Wilbur et al. 15392* (DUKE). COCLÉ: Río Grande, *Burch et al. 1167* (GH, MO, US). Aguadulce, near sea level, *Pittier 4958* (US). Penonomé, 50–1000 ft, *Williams 108* (NY, US). HERRERA: 1 mi N of Chupampa, on road to Ocú, *Wilbur et al. 12110* (DUKE). LOS SANTOS: Las Tablas-Pedasí, 0–100 m, *Burt & Rattray 58* (MO). Las Tablas-Chitré, 0–100 m, *Burt & Rattray 63* (MO). Pocrí, beach, *Dwyer 1189* (MO). Playa de Monagre, 0–5 m, *McDaniel 8048* (DUKE, FSU). PANAMÁ: San Carlos, 0–10 m, *Allen 1132* (GH, MO, US). Coronado Beach, 6 mi E of San Carlos, *Croat 14263* (MO). Chepo Highway W of Pacora, *Duke 5934* (MO). Río Ailigandí, *Duke 10853* (MO). Bayano Cuna, *Duke 14502* (MO). Chagres, *Fendler 101* (MO). Bella Vista, *Heriberto 31* (US). Vera Cruz beach, *Lewis et al. 3005* (DUKE). Bald Hill Road, San Jose Island, *Johnston 1060* (GH, MO, US). 2 km W of El Llano, *Nee 7968* (MO). Bella Vista, *Standley 25395* (US). Corozal Road, near Panama, *Standley 26797* (US). Río Mar, *Tyson et al. 2316* (FSU, SCZ). VERAGUAS: Río Santa María along road to Santiago, 5 km S of Santa Fé, 250–300 m, *Nee 8138* (MO).

28. LABLAB

W. G. D'Arcy[61] & Muriel E. Poston[62]

Lablab Adans., Fam. Pl. 2: 325, 550. 1763. *Dolichos lablab* L. = *Lablab purpureus* (L.) Sweet.

Dolichos sensu auct., non sensu Verdcourt 1971; International Code of Botanical Nomenclature 1978, p. 352. See Westphal, Taxon 24: 189–192. 1975.

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Herbs usually twining, stems terete, strigulose. *Leaves* trifoliolate, leaflets rhomboid to ovate, apically acute, basally cuneate, stipellate, the stipules small. *Inflorescences* axillary racemes, the rachis elongate, the flowers 1–5 arising from tubercles on the rachis, the bracts caducous. *Flowers* with campanulate calyx, the lobes 5, the upper teeth united to apices; standard orbicular, auriculate, 2 callosites or elongated appendages on the inner face, the wing obovate, the keel falcate; stamens diadelphous, vexillary stamen free, the anthers monomorphic; style curved, flattened, the stigma capitate. *Fruits* broadly oblong to falcate, laterally compressed, beaked, seeds ovoid, black, hilum oblong with a white aril.

Lablab is endemic to the Old World with cultivated species found in the New World.

1. **Lablab purpureus** (L.) Sweet, Hort. Brit. 481. 1826. [1827].—FIG. 31.

Dolichos purpureus L., Sp. Pl., ed. 2. 1021. 1763. TYPE: not determined.
Dolichos lablab L., Sp. Pl. 725. 1753. LECTOTYPE (design. Verdcourt): *Phaseolus niger lablab* Alpini, De plantis Aegypti liber, ... 74, *tab. 75*. 1640.

Climbing *herbs*; stems terete, strigose. *Leaves* trifoliolate, leaflets ovate to broadly rhomboid, 8.0–13.0 cm long, 6.5–12.5 cm wide, the lateral leaflets asymmetric, apically acute, basally cuneate to truncate; petioles 8.0–12.0 cm long, strigose; petiolules 2.5–3.0 cm long, strigose, stipels linear, 4.0 mm long, the stipules lanceolate, 4.0–5.0 mm long, caducous. *Inflorescences* axillary racemes to 30.0 cm long; flowers 10–15 per rachis, fasicled in groups of 2–3 at tubercles on the rachis; peduncles 18.0–15.0 cm long, the pedicels short 0.3 cm long; bracts subtending the flowers ovate, 3.0 mm long, 2.0 mm wide, strigose, caducous. *Flowers* with the calyx campanulate, 6.0–8.0 mm long, the lobes 2.5–3.0 mm long, upper 2 lobes fused; corolla white to purple, standard obovate, auriculate with 2 callosites running along the inner face, 1.5 cm long, 1.2 cm wide, the wings oblong to obovate, 1.5 cm long, 1.0 cm wide, the keel falcate, 1.5 cm long, 0.4 cm wide; stamens 1.5 cm long; style 1.3–1.5 cm long curved, flattened, the stigma capitate. *Fruits* broadly oblong, 5.2–8.0 cm long, 1.5–2.5 cm wide, strigose, the beak falcate, 1.0–1.5 cm long; seeds ovoid, 3–5, 1.3 cm long, 0.8 cm wide, the hilum oblong with white aril.

CANAL ZONE: Summit, *Johansen* May 1924 (US). Balboa, Sosa Hill, *Standley 25284, 32151* (both US).

29. LENNEA

Peter S. White[63]

Lennea Klotzsch in Link, Klotzsch and Otto, Ic. Pl. Hort. Berol. 2: 65. *tab. 26*. 1842. TYPE: *Lennea robinioides* Klotzsch (Mexico) = *Lennea melanocarpa* (Schlecht.) Vatke.

Trees or *shrubs*. *Leaves* alternate, imparipinnate; rachis grooved; stipels narrowly triangular or setaceous, persistent; stipules deciduous. *Inflorescences* of

[63] Uplands Field Lab., Great Smoky Mts. National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

FIGURE 31. *Lablab purpureus* (L.) Sweet—A. Habit (×7/10). [After *Schultes & Smith 308*, Colombia]—B. Fruit (×7/10). [After *de la Cruz 4325*, Guyana.]

axillary racemes, frequently clustered at the nodes, generally shorter than the leaves, appearing with or before the leaves; bracts triangular to subulate, deciduous by fruiting stage; bracteoles absent. *Flowers* with hypanthium campanulate, the 5 teeth triangular, often acuminate, mostly as long as or shorter than the cup; petals equal, short-clawed, free except the keel petals united along lower margin at the apex, the standard obcordate, the wing and keel petals oblong, curved; stamens 10, monadelphous, the vexillary stamen fused to staminal sheath for a short distance towards the base, free above and below this; ovary sessile or short stipitate, slender, several-ovulate, the style coiled, the stigma terminal, small. *Fruits* linear, flattened, few to several seeded, 2-valved; seeds compressed, oblong to nearly circular.

Lennea Klotzsch is a genus of five species found in northern Central America, Mexico, Honduras, and in Panama. It is to be expected in Nicaragua and Costa Rica. It is apparently unknown from South America, although several collections have been made in Darien Province in eastern Panama.

The genus was described from plants grown horticulturally in Germany from seed collected in Mexico. Like other relatives described here it resembles the temperate genus *Robinia*. The coiling of the style is distinctive among related genera in Panama.

1. **Lennea viridiflora** Seem., Bot. Voy. Herald 107 (corrected page). 1857. TYPE: Santiago de Veraguas, Panama, *Seemann 1189* (K, not seen; photo F, MO).—FIG. 32.

L. rubioides Seem., Bot. Voy. Herald 107 (uncorrected page). 1853. Nomen nudum.

Small *trees*; branchlets hairy with stiff hairs to glabrous, dull, tan to grayish. *Leaves* with 9–13 elliptic to ovate leaflets, the lateral leaflets mostly opposite or subopposite, obtuse or often retuse, 2–8 cm long, 1–4 cm wide, the first pair often the smallest on the leaf, thin in texture, dull above, sometimes slightly paler beneath, when mature with appressed, fine, stiff, non-overlapping hairs beneath; stipules narrow, to 5 mm long, apparently deciduous, stipels obvious, setaceous, to 2 mm long, persistent, stiff, the petiolules 2–3 mm long. *Inflorescence* with raceme axis 2–5 cm long, the flowers close, subtended by ovate-triangular bracts, pedicels 2–3 mm long, the axis, bracts and the pedicels pubescent with stiff dark red brown or yellow brown tinged hairs. *Flowers* ca. 7–9 mm long with the petals extended, the hypanthium tube campanulate, ca. 3 mm long, the 5 teeth narrow triangular, acute, extending ca. 1 mm beyond the rim of the cup, the lowermost tooth longest, ca. 1.2–1.8(–2) mm long, the 2 uppermost united for about ½ of their length, the whole calyx pubescent with stiff hairs as on the inflorescence; petals of subequal length, the standard reflexed, circular, ca. 6 mm long, 6 mm wide, glabrous, the claw ca. 1 mm long, wings oblong, ca. 5 mm long, glabrous, the claw ca. 2 mm long, the keel petals fused for part of the length, ca. 7 mm long with scattered hairs or glabrous; stamens 10, the vexillary stamen leaving the sheath near the base, the 9 other stamens leaving the sheath in a regular series, the outermost with longer free filaments, the innermost with shorter filaments as seen when the sheath is opened at the position of the vexillary stamen;

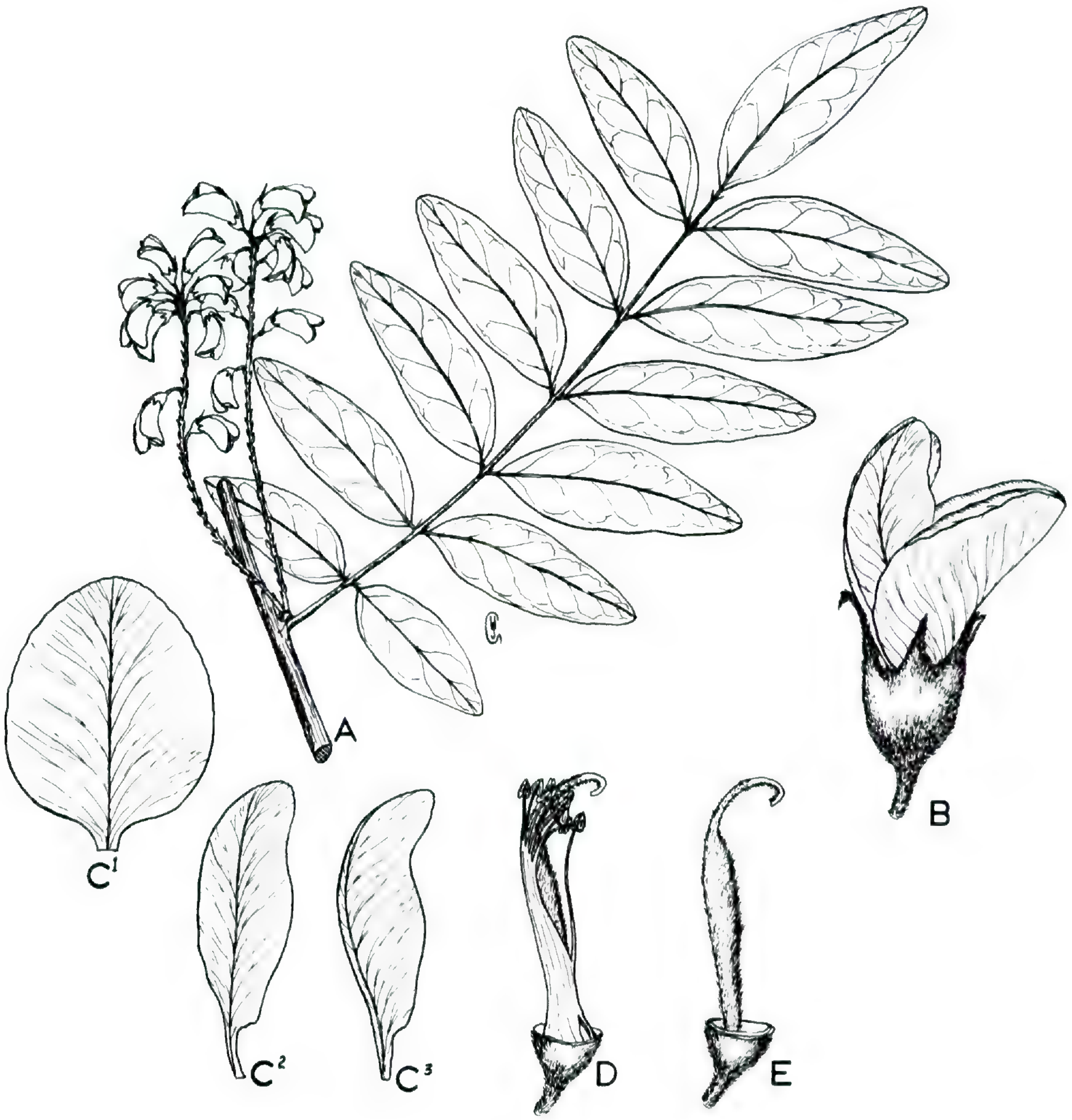

FIGURE 32. *Lennea viridiflora* Seem.—A. Habit (×3/5).—B. Flower (×3 3/5).—C. Corolla.—C¹. Standard (×3 3/5).—C². Wing petal (×3 3/5).—C³. Keel petal (×3 3/5).—D. Stamens (×3 3/5).—E. Pistil (×3 3/5). [After *Pittier 5101*.]

ovary compressed, linear, ca. 5 mm long, appressed hairy, the style coiled, sometimes forming an almost complete turn, the stigma terminal, capitate. *Fruit* compressed, narrow oblong, tapered abruptly to acute tip formed by the persistent style base, with woody valves, compressed strongly between the seeds, the outer surface dark brown, strongly reticulate wrinkled, at least on drying, usually glabrous but sometimes with remote hairs on the surface and with scattered hairs on the edges; seeds 3–6, compressed, roundish to oblong, dark brown, smooth, ca. 8 mm long, 7 mm wide.

Lennea viridiflora Seem. is apparently endemic to Panama where it was first collected by Seemann in Santiago de Veraguas. In the original printing of the Botany of the Voyage of the Herald, Seemann lists this plant as "*Lennea ru-*

bioides'' and attributes this name to Link, Klotzsch, and Otto. This is an apparent corruption of *Lennea robinioides* Klotzsch (=L. *melanocarpa* [Schlecht.] Vatke). Seemann soon came to recognize that his collection was distinct from *Lennea melanocarpa*, and in a correction page printed in 1857 described it as a new species, *Lennea viridiflora* Seem.

Lennea viridiflora is apparently closely related to *Lennea salvadorensis* Standl., a plant known only from the type locale in El Salvador. *Lennea salvadorensis* bears an overall resemblance to *L. viridiflora*, but the calyx and flowers are smaller, and the fruits are lighter brown in color. Two other species of *Lennea* also resemble *Lennea viridiflora*. *Lennea brunnescens* Standl. of Mexico can be distinguished by the dense pilosity of the legume surface, glabrous or with remote hairs in *Lennea viridiflora* as treated here. *Lennea melanocarpa* (Schlecht.) Vatke bears a close similarity in leaf to *L. viridiflora*, but the inflorescence axis is glabrous and more slender. It should be noted that the inflorescence of *L. viridiflora* becomes glabrous in fruit. The calyx of *Lennea melanocarpa* is also glabrous or only puberulent near the margin. In *L. viridiflora* the calyx is closely and densely pubescent with straight, stiff hairs. The fifth and final species of *Lennea*, *L. modesta* Standl. & Steyermark, is found in Guatemala. Its abruptly tapered leaflets are distinctive.

Two Panamanian collections possess somewhat unusual features: *Pittier 5101* has calyx lobes longer than those on other flowering collections. In this flowering collection, the longest calyx lobe averages 2 mm in length (1.8 mm on younger flowers), whereas for the other collections the longest calyx lobe ranges from 1.2–1.5 mm (maximum 1.8 mm) long when the flower is fully expanded. The Pittier collection is the only one from Cocle Province. The absence of other differences argues that these collections do not represent a species distinct from *Lennea viridiflora*, as the calyx lobe lengths are somewhat variable depending on flower age. The other unusual collection is *Duke 4873*. This fruiting collection has scattered hairs along the legume margin and remote hairs on the surface of the legume.

CANAL ZONE: Madden Dam, *Ebinger 874* (F, MO). Gaillard highway, N of Paraiso, *Lewis et al. 5367* (DUKE, MO, NY, SCZ). Boy Scout Road, Madden Dam Area, *Porter et al. 4025* (DUKE, GH, MO, NY, SCZ). Farfan Beach, *Tyson et al. 3164* (MO). Miraflores Locks, near Fort Clayton, *Tyson 5340* (DUKE, FSU, MO, SCZ). N of Miraflores road at railroad, *Tyson & Gentry 6409* (GH, MO, NY, SCZ). Road to Miraflores Locks, *Tyson & Lazor 6064* (FSU). COCLÉ: Between Paso del Arado and Olá, 20–280 m, *Pittier 5101* (US). DARIÉN: Hill near Río Chucunaque ca. 4 mi below Yaviza, *Duke 4873* (GH, MO, NY, SCZ). Near Refugio, 15–21 mi N of Santa Fé, 30 m, *Duke 10311* (MO). Río Sabana above Santa Fé, *Duke 14083* (DUKE, F, GH, NY, MO). Patiño, *Pittier 6609* (GH, specimen labeled ''B''; NY-photo, left-hand specimen; US, left-hand specimen). Río Congo, *Pittier 6976* (US). VERAGUAS: Santiago, *Seemann 1189* (not seen, photo-F, NY).

30. LUPINUS

David B. Dunn[64]

Lupinus L., Sp. Pl. 721. 1753; Gen. Pl., ed. 5. 322. 1754. TYPE: *L. albus* L.

Mostly erect or ascending *herbs*, rarely shrubs; roots sometimes stout, sometimes with large nodules; stems mostly pubescent. *Leaves* 5- or more digitate,

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the leaflets narrow, pubescent, sometimes sericeous, sometimes glaucous, with a single midnerve; petiolules inconspicuous; petioles elongate; stipules mostly narrow, adnate to the petiole. *Inflorescences* often showy, blue, purple, red or yellow, racemose, the rachis terminal, several–many flowered; pedicels slender. *Flowers* with the calyx 2-lipped nearly to the base, the upper lip about as long as the lower; corolla glabrous or sparingly pubescent, the standard broad, the wings apically connate, the keel often beaked; stamens monadelphous, the filaments unequal, glabrous, the anthers dimorphic; ovary sessile, the style curved upwards, the stigma capitate, often bearded. *Legume* oblong, somewhat compressed and obliquely constricted between the seeds, dehiscing explosively with a spiral tension, 2–12 seeded; seeds plump with a small, sunken hilum.

The genus includes about 200 species in western North America but with species throughout the western hemisphere and in the Mediterranean region. Perhaps as many as 200 species occur in South America. Many species grow in full sun and sandy soil. Some species are used for fodder, while others are well known for poisoning cattle. The toxicity varies with species as to part of the plant implicated, type of toxic response, etc. Nothing is yet known about the toxicity of the Panamanian species. In some countries, the seeds have been used as a coffee substitute following leaching of alkaloids from the seeds. "Lupin" (English), "Altramuz," "Lupino" (Spanish).

a. Plants erect, to 50–100 cm tall, branching above; leaflets 5–7, the largest 3–4 cm long, 8–11 mm wide, complanate; standard 10–13 mm long, the keels glabrous or occasionally sparsely ciliate above distally; stipules to 5 mm long ---------- 1. *L. clarkei*

aa. Plants decumbent in age 15–30 cm long, branching at the base; leaflets 8–11, the largest 2–3 cm long, 3–6 mm wide, conduplicate; standard 9–10 mm long, the keels densely ciliate above distally; stipules 12–15 mm long ---------- 2. *L. costaricensis*

1. **Lupinus clarkei** Oerst., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1853. 1. 1854. TYPE: Costa Rica, *Oersted 4891* (C, not seen, photo UMO; isotype K).—FIG. 33.

L. elegans var. *campestris* sensu Smith, Sp. Lupulin. 93. 1938, not var. *campestris* (Schlecht. & Cham.) Smith, Sp. Lupulin. 77. 1938. Based on *Seemann* (K, not seen by Smith or this writer), *Maxon 5304* (US) and *Killip 3605* (herb. Smith, not seen).

Normally annual branched *herb* to 1.5 m tall, mature stems terete, rigid, puberulent to tomentose, the twigs drying minutely angled. *Leaves* 5–7 digitately compound, the leaflets 3.5–4.5 cm long, 6–10 mm wide, narrowly ovate to oblanceolate, apically obtuse or rounded, mucronulate, basally narrowed into the indistinct petiolule, the costa prominent, conspicuously elevated beneath, subplane above, the lamina glabrate to sparsely pubescent on both sides, the hairs spreading and curled, to 1 mm long, shorter and denser beneath, the margins pilose, the undersides with a whitish bloom; petiolules to 1 mm long; petioles slender, 3–5 cm long, slightly exceeding the leaves; stipules narrowly deltoid to linear subulate, ca. 3 mm long, dark, pubescent. *Inflorescences* showy terminal racemes, blue or purple with pinkish or reddish tinges, the rachis tomentose with curved hairs and moniliform hairs to 1 mm long, 6–15 cm long, the flowers uncrowded on pedicels ca. 3 mm long. *Flowers* with the calyx deeply divided, the lower lip somewhat reflexed, 4–5 mm long, entire or 3-denticulate tomentulose,

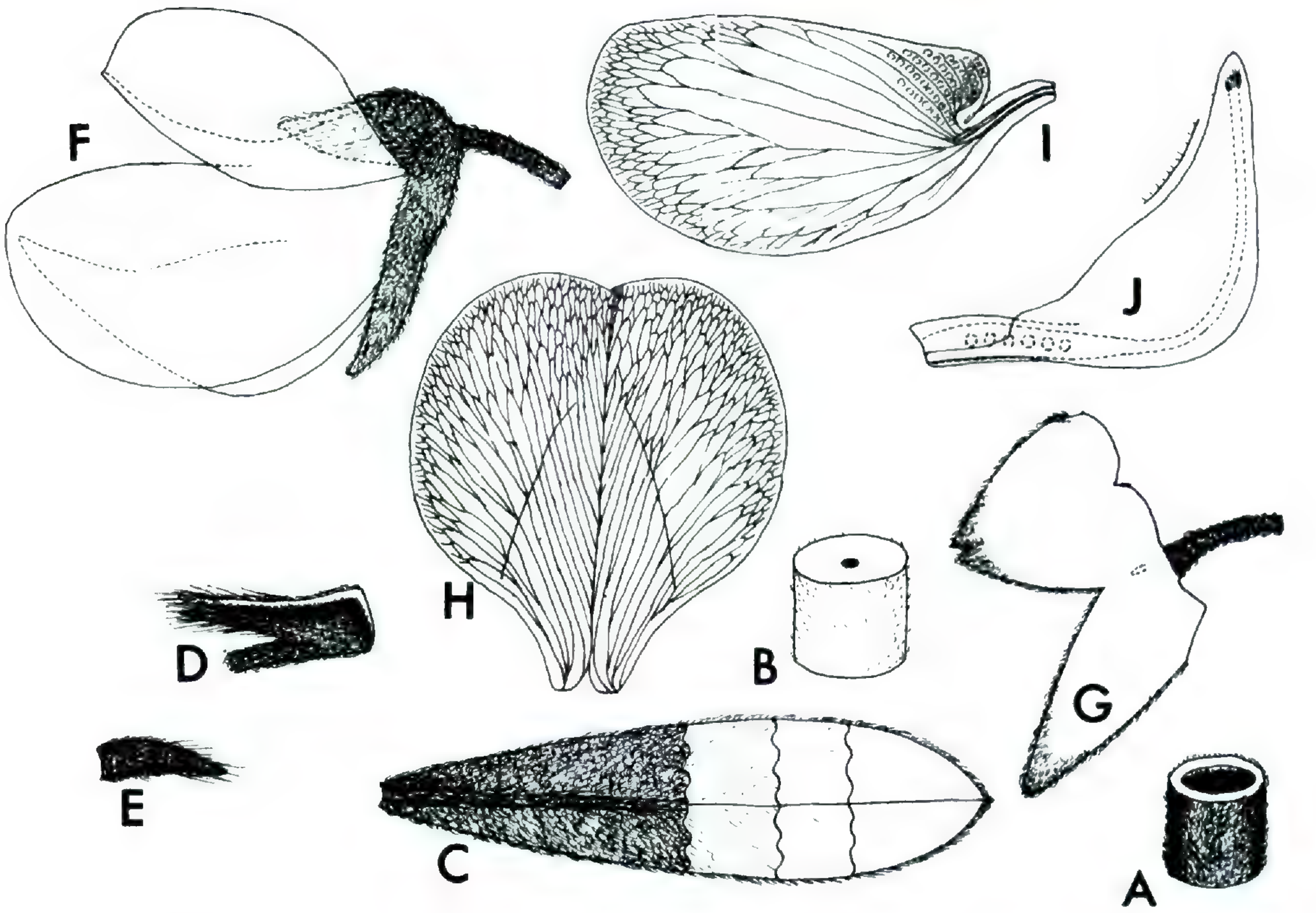

FIGURE 33. *Lupinus clarkei* Oerst.—A. Young stem (×3⅓).—B. Stem at end of growing season (×3⅓).—C. Leaflet (×1⅔).—D. Stipule (×3⅓).—E. Bract (×3⅓).—F. Flower (×3⅓).—G. Calyx (×3⅓).—H. Standard (×3⅓).—I. Wing petal (×3⅓).—J. Keel showing outline of gynoecium. [After series of 25 dissections at hand.]

the upper lip ca. 5–7 mm long, minutely bifid, applied to the standard; standard blue or purple, 10–13 mm long, broad, the wings apically united, often partly pinkish or red, slightly longer than the standard, the keel glabrous, slightly saccate with narrow beaks, sometimes sparsely ciliate; anthers dimorphic, the lowermost linear, 2 mm long, the uppermost ovoid, ca. 0.5 mm long; ovary copiously ascending pilose, the style evenly curved upward, the stigma capitate, long bearded. *Legume* oblong, ca. 4 cm long, 8–10 mm wide, with distinct, oblique constrictions between the 7–8 seeds, drying dark, sometimes slightly reddish, copiously pilose with hairs to 2.5 mm long, minutely beaked; fruiting pedicels stout but not much longer than in flower; seeds plump, mottled, dark, ca. 5 mm long.

Lupinus elegans H.B.K. [TYPE: Mexico, herb. H.B.K. (P not seen; microfiche MO)] to which the Cham. & Schlecht., *Lupinus campestris* was subordinated by Smith is not closely related to either *L. clarkei* or *L. campestris*. *Lupinus clarkei* and *L. campestris* are part of a closely related complex.

This species is known from Panama, Costa Rica and Honduras and is found in open upland sites, commonly above 2,000 m elevation.

CHIRIQUÍ: 10 mi above Boquete on road to Volcán, *Croat 34819* (MO). Potrero Muleto, *Croat 34946* (MO). Roadside to 10 km below summit of El Barú toward Boquete, *D'Arcy 9776, 9791, 11055* (all MO). W slope of Chiriquí Volcano, *Davidse & D'Arcy 10246* (MO). Boquete District, Volcán de Chiriquí, *Davidson 866* (GH, MO, US). Cuesta Grande, E Slope of Chiriquí Volcano, 2900 m, *Maxon 5304* (US). Volcán Barú, *Mori & Bolten 7419* (MO). Finca Lérida to Peña Blanca, 1750–2000 m,

Woodson & Schery 326 (MO, US). Boquete District, Volcán de Chiriquí, 11200 ft, *Terry 1328* (MO). Canyon 5 mi NE of El Volcán, 7500 ft, *Tyson 6349* (MO). Potrero Muleto to summit, Chiriquí Volcano, *Woodson & Schery 394* (MO). Casita alto, Chiriquí Volcano, 1500–2000 m, *Woodson et al. 805* (A, MO).

2. **Lupinus costaricensis** Dunn[65]. TYPE: Costa Rica; *Dodge & Thomas 6826* (MO-holotype; photo UMO, isotypes GH).—FIG. 34–35.

L. aschenbornii sensu Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 545. 1938, not Schauer, Linnaea 20: 739. 1847.

Annual *herb*, occasionally extending into a second season of growth, then ligneous below, weak stemmed and sprawling to decumbent, to 15–30 cm long, branching mainly at the base, the slender terete stems only 2.5 mm diameter, densely canescent with curved hairs ca. 0.5 mm long, and with numerous spreading pilose hairs 1–2 mm long, glabrescent. *Leaves* 8–11-digitately compound, the larger leaflets 2–3 cm long, 3–6 mm wide, generally conduplicate, glabrous above, thinly pilose beneath; petioles filiform, 4–6 cm long, twice as long as the leaflets, pubescent as on the stems; stipules subulate-caudate, 12–15 mm long, the free tips 6–8 mm long, with both long and short hair types. *Inflorescences* inconspicuous, the lower flowers held within the foliage, the rachis with both hair types as on the stems, racemes only 5–12 cm long, the flowers whorled or scattered; bracts 5–10 mm long, caducous by anthesis; pedicels 2.5–3.5 mm long, hispidulose. *Flowers* with the calyx strongly 2-lipped, the lower lip nearly straight, 5–6.5 mm long, entire or tridentate, densely pilose canescent outside, the upper lip 4–5 mm long, deeply bifid, the notch 1.6–3 mm deep; the standard obovate; 9–10 mm long, 7–8 mm wide, the wings apically connate, slightly longer than the standard, less than 5 mm wide, occasionally with lateral cilia on the veins of the crimped basal portion, the keels densely ciliate above toward the acumen; ovary strongly ascending pilose, the style curved upward, the stigma capitate, bearded. *Legume* oblong, 2–3 cm long, 6–7 mm wide, canescent and copiously pilose with longer hairs, slightly constricted between the 7–8 seeds; seeds dark, mottled, convex, 3 mm long, 2 mm wide.

The taxon described here is quite distinct from *L. aschenbornii,* which is caespitose, often fistulose, perennial and freezes back annually to a subsurface fleshy taproot. C. P. Smith studied the type of *L. aschenbornii* and he cited multiple specimens from Nevado de Toluca and Popocatepetl as typical of *L. aschenbornii*. Smith considered Nevado de Toluca as the most probable type locality.

This species is known only from Volcán Chiriquí and Costa Rica. It is found high on the slopes of volcanos in open areas. Plants with only the primary inflo-

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[65] *Lupinus costaricensis* Dunn, spec. nov. *Herbae* annuae, caules 2.5 mm crassi, pagina multis pilis patentibus 1–2 mm longis ferenti, canescenti pilis crispis brevibus 0.5 mm longis. *Foliola* foliorum majorius 8–11, linear-oblanceolata, conduplicata, supra glabra, inferius tenuiter pilosis, 2–3 cm longis, 3–6 mm latis; petioli filiformibus, 4–6 cm longis; stipulis subulatis-caudatis, 12–15 mm longis, ad petioli 6–7 mm ad basim connatis. *Inflorescentiae* inconspicuae, racemis 5–12 cm longis. *Flores* calycibus bilabiatis, labio superiore 4–5 mm longo, bifido, incisura 1.6–3 mm profunda, labio inferiore 5–6.5 mm longo, integro vel tridentato, vexillo obovato, 9–10 mm longo, 7–8 mm lato, carina dense ciliata supra distaliter. *Legumen* dense pilosum, oblongum, 2–3 cm longum, 6–7 mm latum; semina 7–8, fusca, 3 mm longa, 2 mm lata.

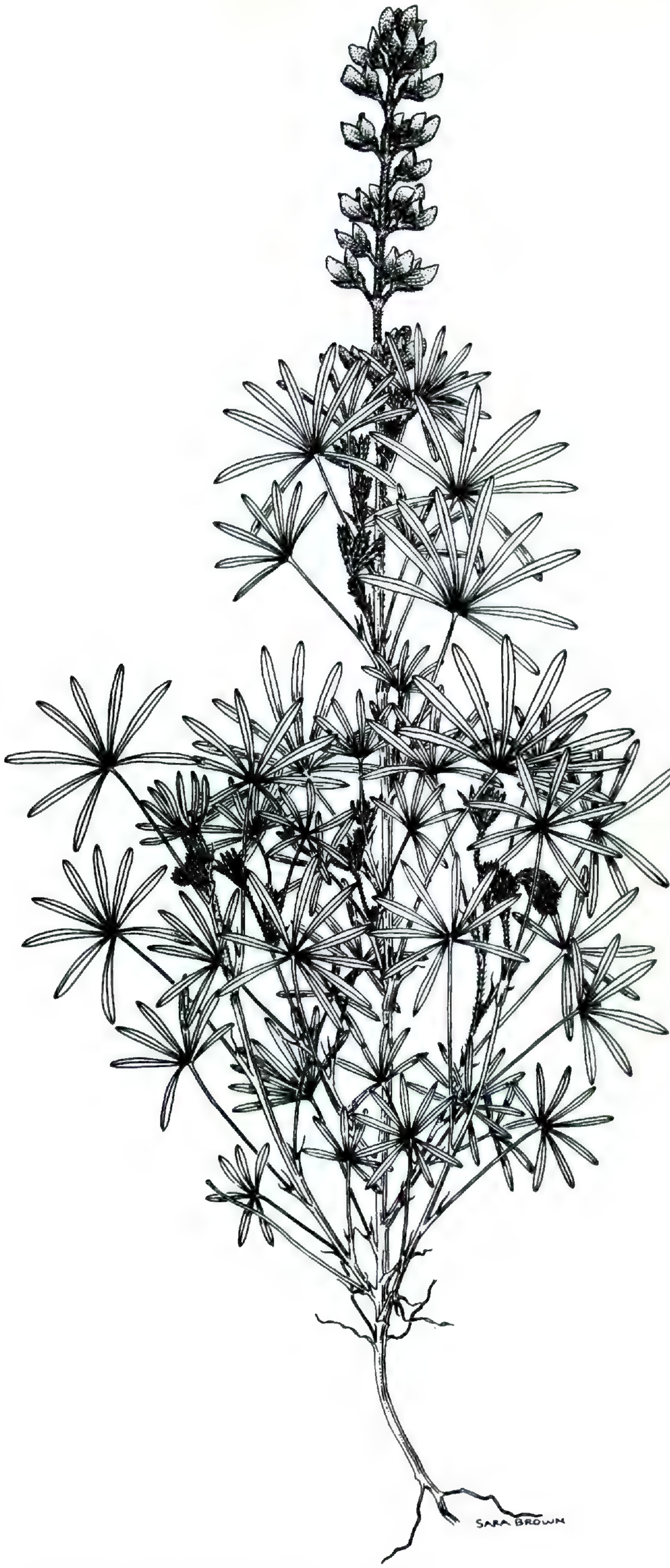

FIGURE 34. *Lupinus costaricensis* Dunn. Habit (×½).

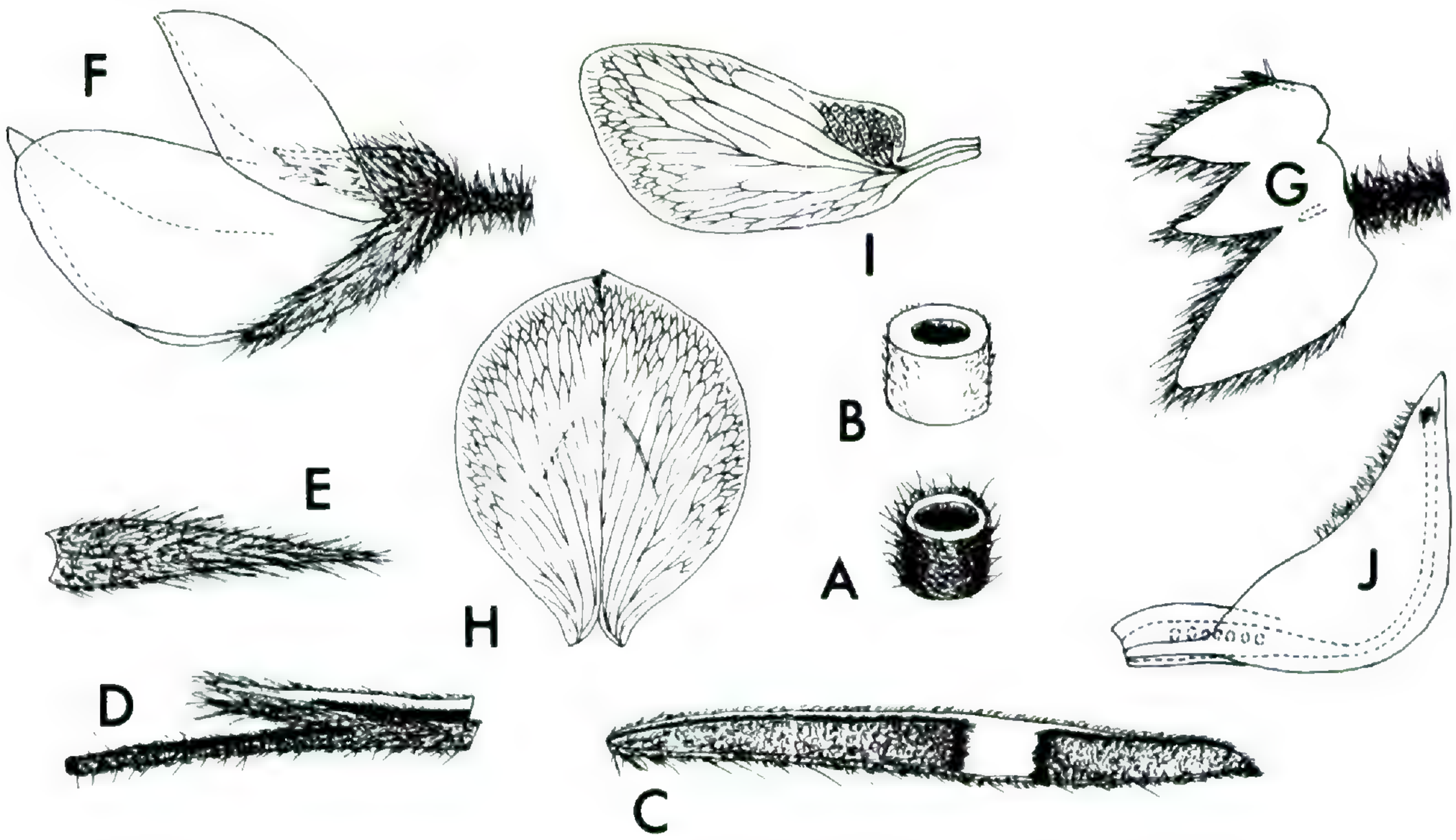

FIGURE 35. *Lupinus costaricensis* Dunn.—A. Young stem (×3⅓).—B. Stem at end of growing season (×3⅓).—C. Leaflet (×1⅔).—D. Stipule (×1⅔).—E. Bract (×3⅓).—F. Flower (×3⅓).—G. Calyx (×3⅓).—H. Standard (×3⅓).—I. Wing petal (×3⅓).—J. Keel showing outline of gynoecium (×3⅓). [After a series of 15 dissections at hand.]

rescences flowering were generally collected from January through March. Occasional collections from August to October were sprawling and ligneous below, with multiple inflorescences in fruit and only occasional late branches with few flowered racemes.

COSTA RICA: CARTAGO: Volcán Irazú, 10000–11330 ft, *Allen 682* (GH); 2400 m, *Blaisdell 2* (MO); 3350 m, *Brooks*, Jan. 1970 (UMO); *Davidse & Pohl 839* (MO); 2400 m, *Dodge 3423* (MO). Finca Chiluca, S slope Volcán Irazú, *Dodge & Thomas 6826* (GH, MO). Volcán Irazú, 9000 ft, *Hunnewell 16632* (GH); 10000 ft, *Mart 4798* (GH); 3350 m, *Moore, Jr., 6654* (BH); *Seibert 1622* (MO); *Webster et al. 12093* (MICH). Finca Chiluca, S slope Volcán Irazú, *Wilbur & Stone 8734* (MSC). Volcán Irazú, 3350 m, *Williams 16024* (MO); *Williams & Molina 13905* (GH). PANAMA: CHIRIQUÍ: Cerro Pando, Valley of upper Río Chiriquí Viejo, *White 51* (MO).

31. MACROPTILIUM

James A. Lackey[66] & W. G. D'Arcy[67]

Macroptilium (Benth.) Urb., Symb. Ant. 9: 457. 1928.

Phaseolus sect. *Macroptilium* Benth., Comm. Legum. Gen. 76. 1837. TYPE: *M. lathyroides* (L.) Urban.

Vines or sometimes erect or sprawling *herbs*, sometimes perennial from a thick rootstock. *Leaves* pinnate trifoliolate or rarely unifoliolate; leaflets glabrous or pubescent but lacking uncinate hairs, stipels ciliate to tomentose; stipules nervate, not prolonged below the insertion. *Inflorescences* with stiff, elongate

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peduncles, the flowers mostly congested at the apex; bracteoles narrow, at least distally, nervate, caducous, rachis with small swellings at the nodes, lacking extrafloral nectaries; pedicels equalling or shorter than the calyx. *Flowers* purplish, red, violet, or white, the interior often vivid; calyx campanulate, the teeth free, the upper 2 teeth sometimes reduced; standard orbicular, emarginate, with 2 small basal auricles, lacking median thickenings; wings longer than the standard and the keel, long stipitate, the keel petals apically spiralled, basally adnate to the staminal tube; style apically recurved and thickened, caducous. *Legume* linear, turgid or compressed, non septate; seeds numerous, small with a short hilum.

Macroptilium is a genus of about 20 species, all native to the New World tropics, although at least one species is naturalized in the Old World. The plants are sometimes planted for forage, and the seeds are sometimes used for food.

a. Stems conspicuously hollow, easily crushed, often 3–7 mm in diameter; standard 12–16 mm long ..... 3. *M. lathyroides*
aa. Stems solid or with a minute, less than 1 mm diameter, lumen, not easily crushed, 1.0–2.5 (4) mm in diameter; standard 8–13 mm long.
  b. Leaflets linear to lanceolate; pods 3–4 cm long ..... 2. *M. gracile*
  bb. Leaflets ovate to broadly lanceolate; pods 4–9 cm long.
    c. Plants pubescent; leaflets generally hastate or mitten-shaped; stems usually solid ..... 1. *M. atropurpureum*
    cc. Plants minutely pubescent to almost glabrous; leaflets generally entire; stems minutely hollow ..... 4. *M. longepedunculatum*

1. **Macroptilium atropurpureum** (DC.) Urban,[68] Symb. Ant. 9: 457. 1928.

Phaseolus atropurpureus DC., Prodr. 2: 395. 1825. 'atropurpureus.' Based on an unpublished plate in Sessé & Mociño, Icones Florae Mexicana (G).

Twining and clambering *vine*; stems long pilose. *Leaves* pinnate trifoliolate; leaflets ovate, elliptical or linear, often 2–3 lobed, the lobes and sinuses mostly rounded; apically acute or obtuse, mucronate, basally obtuse or truncate, the costa and the major lateral veins prominent beneath, obscure above; softly tomentose on both sides, more so beneath, mostly 2–4 cm long, 8–25 mm wide; lateral petiolules ca. 1.5 mm long, terminal petiolule ca. 2 mm long, petiole and rachis spreading short pilose; stipels subulate, 1 mm long, pubescent; stipules narrowly acute, striate, ca. 3 mm long. *Inflorescences* to 30 cm long, the flowers distributed along the apex of the peduncle; peduncle retrorsely short pilose; bracts and bracteoles narrowly ovate, acute, 1–1.5 mm long, cucullate, nervate, ciliolate; pedicels 1–2 mm long, puberulent. *Flowers* deep red to black purple; calyx tubular campanulate, densely pilose or merely puberulent, the tube 4 mm long, the teeth lanceolate, ca. 2 mm long, subequal; standard 1.5–2 mm long. *Legume* linear, 7–10 cm long, 2–4 mm wide, appressed pilose; seeds oblong ovoid, dark, shiny, ca. 3 mm long, the aril white.

Macroptilium atropurpureum is distinct in its pubescent, usually lobed leaves.

This species ranges widely in the neotropics. In Panama it occurs in Pacific watershed areas with substantial dry season.

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[68] For a list of other names see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

CANAL ZONE: Ancón, *Greenman & Greenman 5066* (DUKE). La Boca, *Mori & Kallunki 3675* (MO). Between Corozal and Ancón, *Pittier 2173* (NY). 1 mi N of Summit, *Tyson et al. 2744A* (SCZ). Contractors Hill, *Tyson & Dwyer 6494* (MO). COCLÉ: Río Hato Airstrip, *Burch et al. 1129* (MO.) LOS SANTOS: Chitré-Las Tablas, 0–100 m, *Burt & Rattray 52, 98* (both MO). Monagre Beach, 5 mi SE of Chitré, *Tyson et al. 3011* (SCZ). PANAMÁ: 2 km W of entrance to Lago Mar on Panamerican Highway, *Folsom & Lantz 1901* (MO). Sardinilla, *Taylor 37* (MO).

2. **Macroptilium gracile** (Benth.) Urban, Symb. Ant. 9: 457. 1928.

Phaseolus gracilis Poepp. ex Benth., Ann. Wiener Mus. Naturgesch. 2: 77. 141. 1838. TYPE: Cuba, *Poeppig*, not seen.

Perennial *herb* or *vine*, erect or sprawling; stems slender, wiry, with minute, white retrorse hairs on emerging, soon glabrous, terete; rootstock woody, enlarged. *Leaves* pinnate trifoliolate; leaflets linear, mostly 3–7 cm long, 2–5 mm wide, apically pointed or blunt, mucronulate, basally narrowed, truncate, rarely ovate and 7–8 mm wide, glabrous or sometimes scabrous above; petiolules inconspicuous, ca. 1 mm long, yellowish, strigose; petioles slender, about as long as the terminal leaflet, strongly angled, minutely puberulent; stipels 0.5–1.0 mm long, scale-like; stipules subulate, pubescent, ca. 1 mm long. *Inflorescences* terminal, 20–25 cm long; peduncle slender, the nodes swollen, glandular; bracteoles and bracts subulate, ca. 1.5 mm long, ciliate; pedicels 1 mm long, ca. 2 mm long in fruit, disposed along the apex of the peduncle. *Flowers* red, purple or pink; calyx tubular, ca. 4 mm long, the teeth subequal, deltoid to subulate, much shorter than the tube, evenly minutely puberulent; standard 1.5 cm long, the keel spiralled. *Legume* linear, 3–5 cm long, ca. 2 mm wide; seeds (Standley & Steyermark) 2 mm long, shiny.

This species resembles *Vigna linearis*, but the leaves are often scabrous and are more pubescent. Only the major lateral veins of the leaves are prominently at right angles to the costa whereas in *V. linearis*, much of the minor venation parallels the major lateral veins. The calyces are quite different in the two species.

Macroptilium gracile is wide ranging in Central and South America and in the Antilles, occurring in grassy savannahs with seasonal drought. In Panama it has been collected in the Pacific lowlands.

COCLÉ: Penonomé, *Williams 131* (NY, US). PANAMÁ: Pacora, 35 m, *Allen 815* (MO, NY), *996* (MO). Llanos of lower Río Cabra, *Maurice 791* (US). Panama Golf Course, *Piper 5146* (US). Sabana de Juan Corso near Chepo, 60–80 m, *Pittier 4745* (US). Between Río Pacora and Chepo, *Porter et al. 5137* (MO).

3. **Macroptilium lathyroides** (L.) Urban,[69] Symb. Ant. 9: 457. 1928.—FIG. 36.

Phaseolus lathyroides L., Sp. Pl., ed. 2: 1018. 1763. TYPE: not seen.

Erect *herb*, later sprawling or sometimes twining; stems tough, slender, retrorsely silver pilose on emerging, often glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate or elliptical, mostly 2–4 cm long, 1.5–3.5 cm wide, apically obtuse, short acuminate or acute, rarely rounded, basally deltoid, obtuse, or rounded; densely appressed pilose on emerging, soon glabrate; petiolules 1–2 mm long,

[69] For a list of other names see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

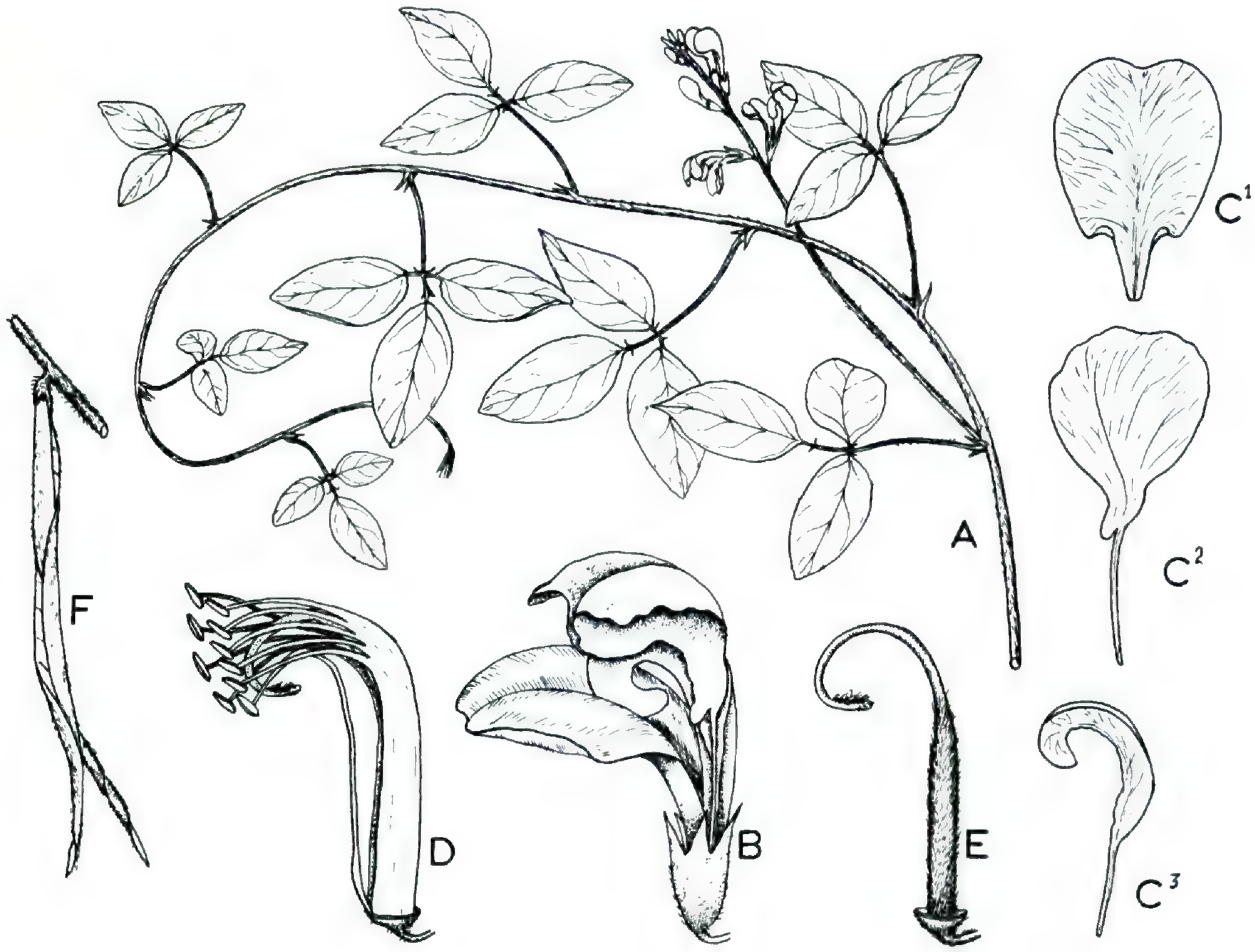

FIGURE 36. *Macroptilium lathyroides* (L.) Urban.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C¹. Standard (×1½).—C². Wing petal (×1½).—C³. Keel petal (×1½).—D. Stamens (×2½).—E. Pistil (×2½). [After *Hunter & Allen 721.*]—F. Fruit (×1½). [After *Hunter & Allen 8601.*]

ascending pilose; petiole and rachis slender, drying angled; stipels lanceolate, glabrous, striate, ca. 3 mm long; stipules lanceolate, striate. *Inflorescences* elongate, mostly 10–30 cm long, the flowers mostly near the apex; peduncle narrowing upwards, the nodes enlarged; bracteoles subulate, pilose, caducous; pedicels shorter than the calyx, often twisted, pilose. *Flowers* scarlet to purple red to nearly black; calyx tubular, 4–6 mm long, pubescent, the teeth lanceolate, much shorter than the tube; standard 12–15 mm long; keel spiralled. *Legume* linear, straight or slightly curved, mostly 7–12 cm long, ca. 3 mm wide, evenly somewhat turgid, maturing brown, inconspicuously strigose; seeds oblong ovoid, 2–3 mm long, dark, mottled.

CANAL ZONE: Mindi, *Cowell 186* (NY). Ancón, *Greenman & Greenman 5067* (MO). Gamboa, *Heriberto 98* (US). Between Farfan Beach and Palo Seco, *Hunter & Allen 438* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 721, 734* (both MO). Fort Randolph, *Maxon & Harvey 6547* (US). Balboa, *Standley 25628* (US). Summit, *Standley 27324* (US). Gamboa, *Standley 28459* (US). Fort Randolph, *Standley 28745* (US). Summit, *Standley 30047* (US). Darien Station, *Standley 31575* (US). COCLÉ: Near Río La Mona, *Blum & Tyson 1886* (MO, SCZ). 2.5 km S of Antón, *Lasseigne 4297* (MO). COLÓN: Las Cruces Trail at Portobelo, *Ebinger 125* (F, MO). Colón, *Rose 22070* (GH, US). HERRERA: Chitré-Davisa, 0–100 m, *Burt & Rattray 67* (MO). 2 mi W of Divisa, *Tyson 5153* (SCZ). LOS SANTOS: Between Tonosí and Macaracas, *Oliver et al. 3576* (MO). PANAMÁ: Matachui to Las Cascadas, *Cowell 337* (NY). Hills between Capira and Potrero, 80–130 m, *Dodge & Hunter 8601* (MO). Taboga Island, *Dwyer 3102* (MO). Juan Franco Race Track near Panamá, *Standley 27684* (US).

4. **Macroptilium longepedunculatum** (Benth.) Urban, Symb. Ant. 9: 457. 1928.

Phaseolus longepedunculatus Mart. ex Benth., Comm. Legum. Gen. 77. 1837. SYNTYPES: Brazil, Paraguay, none seen.
P. campestris Benth., Comm. Legum. Gen. 77. 1837. TYPE: non Benth. 1859.

Perennial *vine*; stems pilose with weak spreading or appressed hairs. *Leaves* pinnate trifoliolate; leaflets ovate, rhombic, elliptical oblong or linear, sometimes shallowly lobed, mostly 2–4 cm long, 1–3 cm wide, sericeous to short pilose, perhaps sometimes scabridulous; apically obtuse, mucronulate, basally truncate; petiolules ca. 1 mm long, tomentose; petioles pilose, drying strongly angled, sometimes longer than the terminal leaflet; rachis short; stipels lanceolate, ca. 1 mm long, long ciliate; stipules lanceolate subulate, 3–5 mm long, nervate, ciliate. *Inflorescences* 20–30 cm long, the flowers clustered at the apex or distributed along the top half of the peduncle, mostly paired; peduncle glabrate; bracteoles and bracts ovate, acuminate, nervate, ciliolate, 1–2 mm long; pedicels stout, 0.5–1 mm long. *Flowers* red to violet; calyx tubular campanulate, pubescent, the tube ca. 3 mm long, the teeth deltoid, the upper pair connate; standard ca. 1.5 cm long. *Legume* linear, straight or slightly falcate, 3–6 cm long, 2–3 mm wide, turgid.

CANAL ZONE: Fort Sherman, *Piper 5887* (NY). Near Old Fort San Lorenzo, *Piper 5961* (NY). COCLÉ: Aguadulce, *Pittier 4889* (US). LOS SANTOS: Chitre-Los Santos, *Burt & Koster 97* (MO). PANAMÁ: Between Río Pacora and Chepo, *Dwyer et al. 5094A* (MO). VERAGUAS: Atalaya-Santiago, 100–200 m, *Koster 114* (MO).

32. MUCUNA

W. G. D'Arcy[70]

Mucuna Adans., Fam. Pl. 2: 325, 579. 1763. Nomen conserv. TYPE: *M. urens* (L.) DC. Type conserv.

Zoophthalmum P. Br., Hist. Jam. 295. 1756. Based on *Dolichos urens* L. = *Mucuna urens* (L.) DC. Nomen rejic.
Hornera Neck., Elem. Bot. 3: 43. 1790.
Citta Loureiro, Fl. Cochinch. 2: 456. 1790. T: *C. nigricans* Loureiro = *Mucuna nigricans* (Lour.) Jackson.
Negretia Ruiz & Pavón, Prodr. 98, *tab. 21*. 1794. LECTOTYPE: *N. elliptica* R. & P. = *Mucuna elliptica* (R. & P.) DC.
Macroceratides Raddi, Mem. Mat. Fis. Soc. Ital. Sci. 18 (fis.): 392. 1820. TYPE: *M. pseudo-stizolobium* Raddi.

Literature:

Burkart, A. 1970. Las Leguminosas-Faséolas Argentinas de los géneros *Mucuna, Dioclea* y *Camptosema*. Darwiniana 16: 175–218.

High climbing woody *vines*. *Leaves* pinnate trifoliolate, the lateral leaflets oblique; stipels scale-like; stipules often caducous. *Inflorescences* axillary racemes, the peduncles often elongate and the pedicels subumbellate, at least in bud, bracts often subfoliaceous, enclosing the bud, caducous; pedicels arising in

[70] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

2's and 3's on an expanded portion of the peduncle. *Flowers* showy, the calyx campanulate, often with irritating hairs, the upper teeth connate, the lower 3 usually unequal; corolla with the standard shorter than the wings, the wings with margins basally ciliate, the keel narrow, apically falcate and indurate; stamens diadelphous, the upper stamen free, the filaments alternately thick and thin, long and short, the anthers sometimes pilose; ovary tomentose, the short stipe surrounded by a glandular disc, the style slender, glabrous or pubescent, the stigma capitate, sometimes of a tuft of hairs. *Legume* oblong, thick or flattened, the margins often winged, undulate between the seeds and somewhat compressed laterally between the seeds, the surface sometimes lamellate with parallel or irregular raised lamellae which may form elongate enations, mostly densely covered with stiff irritating hairs, tardily dehiscent; seeds flat or convex, discoid, the hilum narrow around more than ½ the periphery.

Mucuna is widely distributed in the tropics, mostly confined to moist or wet forests. The genus includes perhaps a dozen species.

a. Inflorescences short, less than 15 cm long; flowering pedicels less than 10 mm long; flowers more than 5 cm long, the wings more than 15 mm wide at the middle ..... 3. *M. rostrata*
aa. Inflorescences elongate, the peduncle more than 30 cm long; flowering pedicels more than 15 mm long; flowers less than 5 cm long, the wings less than 15 mm wide.
  b. Leaves copiously pubescent beneath, at least until flowering.
    c. Flowers less than 4 cm long, the lowest calyx tooth broad, less than 3 mm long; wings less than 8 mm wide; fruit flat, lacking raised lamellae ..... 1. *M. holtonii*
    cc. Flowers more than 4 cm long, the lowest calyx tooth narrow, more than 5 mm long; wings more than 10 mm wide; fruit thick, with conspicuous raised transverse lamellae ..... 4. *M. sloanei*
  bb. Leaves glabrate beneath.
    d. Lowest calyx tooth narrow, 7–13 mm long; lateral leaflets mostly 3-veined from the base; fruit mostly 3–7 seeded ..... 5. *M. urens*
    dd. Lowest calyx tooth deltoid, 3–5 mm long; lateral leaflets mostly 4-veined from the base; fruit mostly 1–3 seeded ..... 2. *M. mutisiana*

1. **Mucuna holtonii** (Kuntze) Moldenke, Phytologia 1: 7. 1933.

Stizolobium holtonii Kuntze, Rev. Gen. Pl. 1: 207. 1891. SYNTYPES: Costa Rica, *Kuntze* (?NY, not seen) and Colombia, *Holton 971* (K, not seen).
Mucuna andreana Micheli, Morot. J. Bot. 6: 146, *tab. 5, 6.* 1892. TYPE: Colombia, *André 1978,* not seen. Also cites *Holton 971,* not seen.

High climbing *vine,* stems slender, slightly angled, minutely tomentulose, tardily glabrescent. *Leaves* trifoliolate, the leaflets about equal, 9–15 cm long, 5–9 cm wide, apically short acuminate, mucronate, manifestly costate, the terminal leaflet with 5–6 major veins on each side, the lateral leaflets strongly oblique, chartaceous, velutinous, later glabrescent especially above, with only a few hair bases remaining; petiolules 7–10 mm long, tomentose, glabrescent and turning black; petioles mostly shorter than the leaves, tomentose, glabrescent; stipules caducous; stipels ca. 3 mm long. *Inflorescences* pendant, contracted, racemes with peduncle elongate, to 5 m long, slender, flexuous, minutely tomentose velutinous, the raceme enclosed in bud by gray velutinous, papery deciduous bracts and forming a globose 'bud' ca. 5 cm across, sinuous; pedicels velutinous, 15–18 mm long upon inflorescence opening, becoming 5 cm long at anthesis and stout in fruit. *Flowers* greenish or yellowish, the calyx deciduous, cupular, velutinous

outside with appressed, ascending gray or golden hairs, ca. 10–15 mm long, pilose inside, the teeth small, deltoid umbonate; corolla ca. 4 cm long, drying dark, the standard 18–22 mm long, the wings and keel narrowly tubular, exserted about ½ their length from the standard; anthers basally barbate with elongate hairs, the stigma capitate, a tuft of ascending hairs. *Fruit* oblong, flat, 1–6 seeded, 14–25 cm long, 5 cm wide, the margin conspicuously undulate between the seeds, softly villous outside, lustrous within and falsely septate between the seeds; seeds discoid, black, 2–3 cm wide, ca. 0.8 cm thick, the hilum linear around $^{3}/_{4}$–$^{4}/_{5}$ of the periphery, lighter colored.

Mucuna holtonii has leaves velutinous on both sides until time of flowering. The inflorescence is greatly contracted, appearing in bud as a ball at the end of a long, slender, pendant peduncle, and later with the flowers on elongate and slightly bent pedicels. The legumes are flat with undulate margins. The legume lacks stinging hairs, but there may be some on the calyx.

This species is found in Panama from sea level to at least 1,500 m, occurring in forests and in areas of disturbance. It ranges from Mexico (Chiapas), to Colombia. It is apparently closely related to Peruvian and Ecuadorean material going under the name *M. elliptica* Ruiz & Pavón, which differs in having seeds slightly thicker and more convex, and in the legumes having stinging hairs. The appearance of the legume and also of its indumentum is much like that of *M. elliptica*.

BOCAS DEL TORO: Banks of Changuinola River, *Dunlap 441* (F, US). Changuinola to 5 mi S at junction Ríos Changuinola and Terebe, 100–200 ft, *Lewis et al. 943* (GH, MO, US). Almirante Bay, *Wedel 8* (MO, US). CANAL ZONE: Road C-16 NW of Pedro Miguel, *Croat 12255* (MO). Pipeline road 3 mi N of Gamboa gate, *Croat 13951* (MO, SCZ). Madden Dam, *Dwyer 1965* (MO, PMA, US). Between Chilibre and Madden Dam on Transisthmian Highway, *Dwyer 8396* (GH, MO). Chagres River 3 mi above Gamboa Bridge, *Kennedy et al. 2304* (F, MO). Pipeline Road 2 km NW of Gamboa, 50 m, *Nee 7853* (MO, US). Gatuncillo, *Piper 5136* (US). Gamboa, *Pittier 4788* (US). COCLÉ: Limón, N of Alto Calvario, *Folsom 5848* (MO). COLÓN: Quebrada Bonita, 13 km NW of Buena Vista, 3 km NW of Salamanca, 100–170 m, *Nee 7632, 9075* (both MO). DARIÉN: Ascent of Cerro Pirre from Río Pirre S of El Real, 100–600 m, *Duke 5286* (MO). Between Rio Perrecénega and Rancho Frío, 500–2500 ft, *Duke & Elias 13877* (MO). Río Aretí, *Duke & Nickerson 14925* (MO). Río Pirre near town of Pirre, *Gentry & Clewell 6922* (MO). Río Pucro below Pucro, *Gentry & Mori 13531* (MO). Quebrada Camachimuricate cerca casa de Bartolo, *Kennedy 2840* (F, GH, MO). Caná, 1750 ft, *Stern et al. 482* (GH, MO). VERAGUAS: Above Santa Fé on slopes of Cerro Tute, 1200–1400 m, *Gentry 6280* (MO).

2. **Mucuna mutisiana** (H.B.K.) DC., Prodr. 2: 406. 1825.—FIG. 37.

Negretia mutisiana H.B.K., Nov. Gen. Sp. Pl. 6: 442. 1823. TYPE: Colombia, *Mutis*, not seen.

High climbing *vine*; stems terete with straight, appressed reflexed hairs, soon glabrous, drying black. *Leaves* trifoliolate, the leaflets about equal, mostly 7–12 cm long, ovate, apically acuminate, basally obtuse or rounded; lateral pair mostly 4-veined, sparingly pilose with straight hairs on both the surfaces, thin and papery, often drying dark; petiolules 7–10 mm long, sometimes stout, the terminal petiolule articulated near the apex, glabrate, tuberculate; petioles mostly somewhat shorter than the leaves; stipels scale-like, 1–3 mm long, glabrate; stipules narrowly ovate, pilose, often caducous. *Inflorescences* subterminal pendant racemes, the peduncle to 3 m long, slender, terminally fine gray puberulent and minutely angled; pedicels 25–40 mm long becoming slightly longer and stout in fruit; bracts broadly ovate, mostly 15–18 mm long, evenly gray velutinous, often

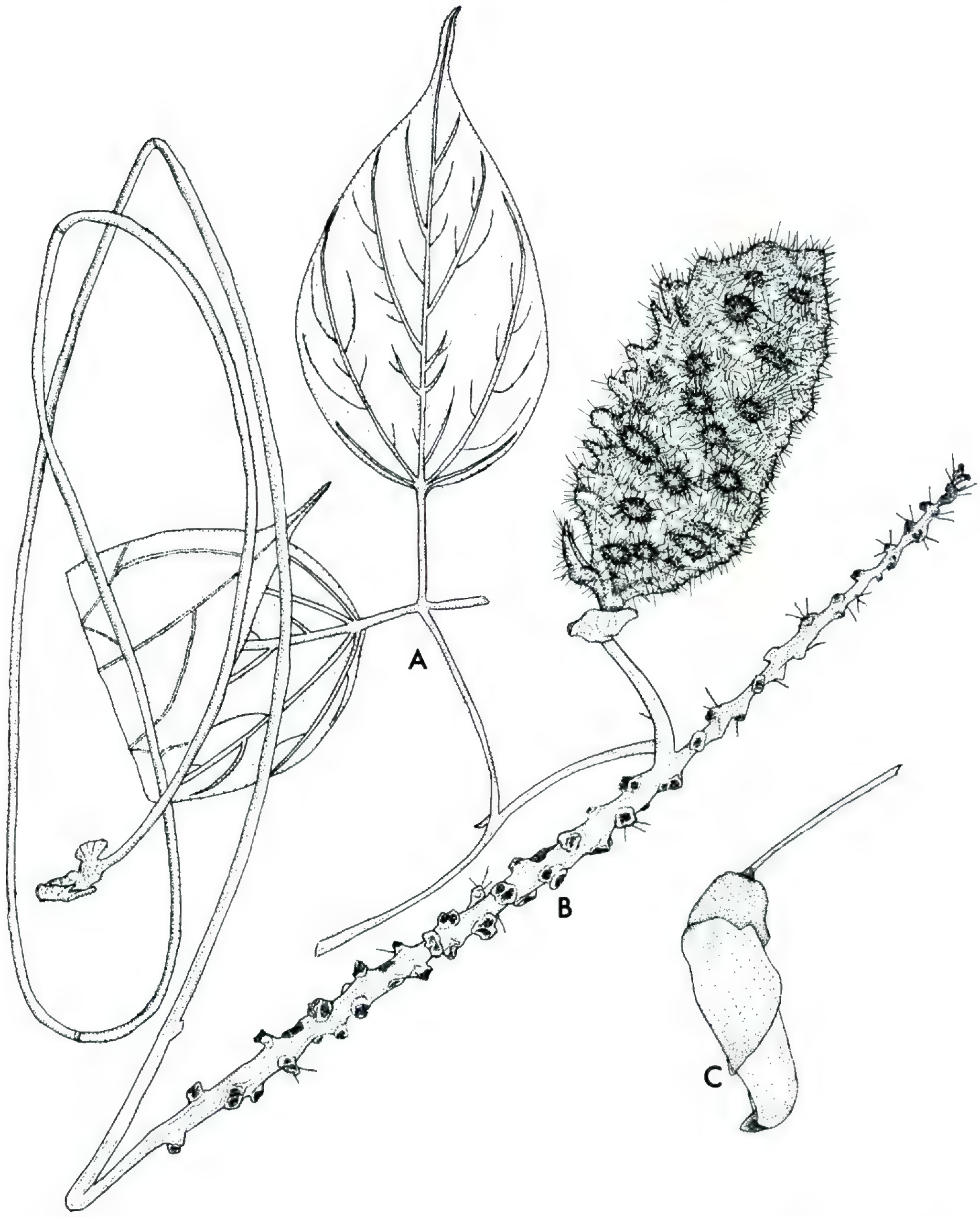

FIGURE 37. *Mucuna mutisiana* (H.B.K.) DC.—A. Leaf with 2 leaflets remaining.—B. Fruiting inflorescence (×½). [After *Hammel 5442*.]—C. Flower (×½). [After *Croat 12790*.]

caducous. *Flowers* showy, white, cream, green or brown, often with purple markings, the calyx cupular, ca. 10 mm long, evenly gray or brown velutinous, the teeth short deltoid, the longest 3–5 mm long; standard ca. 2.5 cm long, mostly enveloping the wings and the keel, the wings 4–5 cm long, darker, connate, apically broadening, the keel 3.5–5 cm long forming a slender tube, but not connate along the upper edge, apically sharply bent and indurated; stamens with the

filaments united ¾ way up, the free portion equal, the united portion biseriate, apically curved; ovary ascending tomentose, the style ascending pilose, less so apically, the stigma minute, peltate. *Legume* few seeded, 6–15 cm long, 3–5 cm wide, constricted between the seeds and undulate along the margin, transversely or obliquely ridged with narrow, irregular lamellae to 3 mm tall, the entire legume covered with brownish deciduous stinging hairs; falsely septate between the seeds, tardily dehiscent; seeds dull, dark brown, convex-discoid, the hilum linear around ¾ of the periphery, the testa hard, almost flinty.

This species is distinguished from other Panamanian species of *Mucuna* by the short lobes on the calyx and by the lamellae on the fruit which sometimes form elongate enations more than 10 mm long.

Mucuna mutisiana occurs in Costa Rica, Panama, Colombia and perhaps farther south.

BOCAS DEL TORO: Almirante-Changuinola Canal, *Blum 1407* (FSU, MO, SCZ). Junction Ríos Changuinola and Teribe, 100–200 ft, *Lewis et al. 935* (GH, MO). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2094* (MO). Chiriquí Lagoon, *Wedel 1003* (GH, MO), *1097* (GH, US), *1106* (GH, MO, US). Water Valley, *Wedel 1486* (GH, MO, US). Old Bank Island, *Wedel 1990* (MO, US). Fish Creek Hills, *Wedel 2430* (GH, US). CANAL ZONE: BARRO COLORADO ISLAND: *Bailey & Bailey 348* (F); *Croat 4800* (MO, SCZ), *7425* (F, MO), *7426* (MO, SCZ), *10167* (MO, SCZ), *11715* (MO), *12593* (MO, PMA, SCZ); *Foster 682* (F, GH, PMA), *1322* (F, PMA), *1424* (F, PMA); *Shattuck 286* (F, MO); *Wetmore et al. 53* (A, F, GH, MO). Road to Pina, 100 m, *Busey & Mahler 344* (F, GH, MO). Pipeline Road near Gamboa, *Clewell & Tyson 3262* (PMA). Dirt road to Chiva-Chiva town, *Correa 495* (MO, SCZ). Highway NW of Summit Garden, *Croat 12611* (F, MO, SCZ). Near Summit Golf Course, *Croat 12790* (MO, SCZ). Allbrook U.S. Army Tropic Test Center, *Dwyer 7116* (MO). Chagres, *Fendler 459* (MO). E of Fort Clayton, *Harvey 5119* (F). K 9 road, *Hladik 42* (MO). Chagres River 3 mi above Gamboa Bridge, *Kennedy et al. 2306* (MO). Río Grande near Culebra, *Pittier 2139* (US). Between France Field and Cativa1, *Standley 30212* (U). George Green Forest Preserve behind Cerro Tigre, *Tyson et al. 2511* (FSU, MO, SCZ). 1 mi N of Summit on road to Gamboa, *Tyson et al. 2754* (FSU, MO, SCZ). Farfan Beach area, *Tyson et al. 3185* (MO). COCLÉ: El Valle, *Ebinger 1124* (F). Penonomé, 50–1000 ft, *Williams 394* (US). DARIÉN: El Real, 15 m, *Allen 970* (GH, US). Yavisa, *Stern et al. 84* (GH). LOS SANTOS: 10 mi SW of El Cortezo, southern Azuero, *Hammel 5442* (MO). PANAMÁ: Río Teribe near El Llano, *Duke 5675* (MO). Río Mamoní, *Duke 6055A* (MO). San Jose Island, *Johnston 209* (GH), *245* (GH, MO, US), *677* (GH). Alcalde Díaz, 190 m, *Nee 8297* (US). Matías Hernández, *Pittier 6885* (GH, US). Río Tapía, *Standley 28275* (US). SAN BLAS: Opposite Ustupo-Concepción, *Mori 393* (WIS).

3. **Mucuna rostrata** Benth. in Mart., Fl. Bras. 15(1): 171. 1859. TYPE: Brasil, *Spruce 1625* (?K, not seen).

High climbing woody *vine*, stems glabrate. *Leaves* trifoliolate, the leaflets mostly 9–12 cm long, ovate, apically acuminate, basally obtuse or truncate, 3–4 veined from the base, above glabrous except for appressed ascending hairs on the principal veins, beneath sparingly short pilose to glabrous, the principal veins with stout, mostly appressed and ascending yellowish or brownish hairs, often tufted at the very leaf base; petiolules 7–9 mm long, pubescent, drying dark; petioles mostly about as long as the terminal leaflet, glabrate; stipels linear, ca. 3 mm long; stipules 3–4 mm long, ascending pubescent. *Inflorescences* short racemes, the peduncle 4–13 cm long, the pedicels subumbellate in bud, often becoming well spaced in flower, ca. 10 mm long, appressed pubescent, becoming 10–20 mm long and stout in fruit; bracts subfoliaceous, velutinous on both sides, early caducous, perhaps confined to the lower portion of the inflorescence. *Flowers* showy, yellow or orange, calyx oblique cupular, softly velutinous with minute

hairs inside and out, and with scattered stout hairs on the cup outside, 2–3 cm long, the upper 2 teeth united into a broadly obtuse hood or into a deltoid lobe 5–8 mm long, the lower 3 teeth narrowly deltoid to linear, ca. 10 mm long; corolla mostly drying black, 6–9 cm long, the standard ½–⅔ as long as the wings, to 5 cm long, the wings mostly rhomboidal, to 1.8 cm wide, sometimes slightly acuminate; keel narrowly falcate, the apex indurated and often drying yellowish; anthers copiously pilose with curly hairs; stigma a capitate cone of hairs. *Legume* oblong, compressed but apparently little compressed between the seeds, with numerous, parallel transverse lamellae to 5 mm tall, 4–5 mm apart, copiously hispid with brownish stinging hairs; seeds not seen.

Mucuna rostrata is distinct from other Panamanian members of the genus in its short racemes, short pedicels, and large flowers. The anthers are more pubescent, the stigma is bigger than other species, and the wing petals are relatively much wider. Little fruiting material has been seen or described in the literature, and the uniformity of the pod is unknown. The pubescence of the leaflet undersides is variable in amount.

This species has been collected a number of times in Bolivia, Peru, and Ecuador but is a rare plant in Panama.

CANAL ZONE: BARRO COLORADO ISLAND: *Netting 25* (F, MO); *Shattuck 489* (F, MO, US); *Wetmore & Abbe 12* (A, F, GH, MO); *Wilson 136* (F); *Zetek 15000* (F). 5 km SE of Achiote, *Gentry & Nee 8715* (MO). Lion Hill, *Goldman 1881* (US). COLÓN: Portobelo, *Pittier 2450* (US). DARIÉN: Río Chucunaque between Yavisa and Río Tuira, *Gentry 13481* (MO).

4. **Mucuna sloanei** Fawcett & Rendle, J. Bot. 55: 36. 1917. Based on *Phaseolus brasiliensis frutescens* . . . . Sloane, Voy. Madera, Barbados, etc. 1: 178. 1707. TYPE: Herb Sloane 3: 69 (BM, not seen, designated by Fawcett & Rendle).

High climbing robust *vine*; stems appressed tomentose, especially near the nodes, glabrescent, the hairs whitish. *Leaves* trifoliolate, the leaflets mostly 7–10 cm long, ovate, apically acute obtuse or short acuminate, basally obtuse or truncate, the lateral leaflets strongly oblique, the midvein prominent, 3-veined at the base, 3–5 prominent veins on each side higher up, glabrescent above, softly fine pubescent beneath with appressed, whitish hairs; petiole mostly as long as or shorter than the terminal leaflet; petiolules ca. 5 mm long, ascending hispid; stipels linear, ca. 2 mm long, the stipules caducous. *Inflorescence* pendant racemes, the peduncle ca. 8 cm long, appressed pubescent with whitish hairs, glabrescent but some pubescence usually persistent in lines, the flowers congested on the enlarged 1–3 cm long rachis; pedicels mostly short, to 15 mm long, pubescent, becoming stout in fruit; bracts subfoliaceous, 1–2 cm long, ovate, cucullate, hispid, early caducous; bractlets wanting. *Flowers* yellow, showy, the calyx cupular, the cup 6–12 mm long, papery, minutely pubescent inside and out, the hairs finer outside but outside with scattered coarse hairs, the upper teeth united into an upcurved lip 10–15 mm long, the lower pair of teeth obtuse, with linear tips, the lower tooth acute or acuminate deltoid, ca. 8 mm long, slightly exceeding the lower pair; corolla ca. 5 cm long, drying orange, the standard 2.5–3 cm long, ?erect, the wings and the keel narrow, exserted ca. 2 cm from the

standard, oblong falcate; style appressed pubescent, the stigma a small capitate knob. *Legume* oblong, mostly 2–4 seeded, ca. 10 cm long, 4 cm wide, short beaked, the surface with prominent transverse lamellae 4–6 mm high, copiously covered with deciduous, yellowish or brownish stinging hairs, the surface constricted between the seeds, the margin winged, the wings irregular, 4–8 mm wide, drying black; seeds convex lenticular, 2–3 cm across.

Mucuna sloanei may be recognized by its pubescent leaf undersides and by its yellow flowers, and there are many minor differences separating the species from other Panamanian elements, e.g. the papery calyx, the erect standard, the orange-drying corolla, the capitate stigma, the caducous bracts and lack of bracteoles etc. Occasional glabrate individuals, e.g. *Tyson et al. 3185* may be confused with *M. mutisiana*.

Mucuna sloanei occurs in the Antilles and in Central America. It is also found, perhaps introduced, in Africa. It has been collected only a few times in Panama, mostly near the sea.

CANAL ZONE: Fort Kobbe, *Duke 6078* (MO). Farfan Beach, *Lewis et al. 56* (GH, MO, US). Farfan Beach area, *Tyson et al. 3185* (FSU, MO). COCLÉ: El Valle, *Allen 78* (MO, US). PANAMÁ: San Carlos, 0–10 m, *Allen 1135* (GH, MO). San Jose Island, *Johnston 248* (GH, MO, US), *530* (GH, US), *957* (GH), *1356* (GH). Bella Vista, *Standley 25351* (US). Taboga Island, *Tyson et al. 5133* (FSU, MO, SCZ).

5. **Mucuna urens** (L.) DC., Prodr. 2: 405. 1825.

Dolichos urens L., Syst., ed. 10: 1162. 1759. Based on *Zoophthalmum* P. Br., Hist. Jam. 295. 1756. TYPE: *Browne*, Jamaica, not seen.
D. altissimus Jacq., Sel. Stirp. Amer. 203, *tab. 182, fig. 85*. 1763. TYPE: not seen.
Stizolobium altissimum (Jacq.) Pers., Syn. Pl. 299. 1807.
Mucuna altissima (Jacq.) DC., Prodr. 2: 405. 1825.

High climbing woody *vine*, stems slender, glabrate. *Leaves* trifoliolate, leaflets mostly ca. 10 cm long, 5 cm wide, ovate, apically acuminate, basally obtuse or rounded, the lateral leaflets oblique, costate with 3 prominent veins at the base and 1–3 prominent veins distally on each side, glabrescent, more so above, beneath with scattered short hair bases persisting, the leaf base sometimes with a few stouter hairs; petioles somewhat shorter or longer than the terminal leaflet; petiolules ca. 10 mm long, drying dark; stipels caducous, stipules scale-like, 2–3 mm long, pilose. *Inflorescence* pendulous, the peduncle elongate, slender, glabrate, the rachis thick, ca. 3 cm long; appressed pubescent, striate, the pedicels slender, 4–5 cm long, stout in fruit, appressed pubescent; bracts not observed. *Flowers* pale greenish white or yellow, the calyx cupular, the cup ca. 9 mm long, the upper teeth united into a rounded or emarginate crest, ca. 10 mm long, the lower pair of teeth deltoid to acute, 6–7 mm long, the lower tooth linear, 11–13 mm long, appressed velutinous outside and inside, a few coarse ?stinging hairs on the cup outside; corolla ca. 4 cm long, the standard, ca. 2.5 cm long, the wings clavate falcate, ca. 8 mm wide at the widest, exserted 8–12 mm from the standard, drying dark; anthers ca. 3 mm long, basally barbate; stigma capitate tufted. *Fruits* oblong, becoming 20 cm long, 6 cm wide, the surface and margin with conspicuous irregular 5–10 mm high lamellae, not constricted between the seeds, copiously hispid with reddish brown stout stinging hairs, the beak slender, 1–2 mm

thick, the stipe slender, 2–3 mm thick, 0–2 cm long; falsely septate between the seeds; seeds not seen.

This species is distinct from other Panamanian species of *Mucuna* in its pod, which is larger and longer with irregular lamellas, and which is sometimes beaked and stipitate. It is also distinct in its calyx, the lower tooth of which is linear deltoid and elongate.

Identifying this material with *M. urens,* which is an Antillean species, is done with some hesitation; no good fruiting material of typical *M. urens* was seen, and the calyx teeth are longer than on most Antillean material. The pedicels are also much longer than those on Antillean material seen. The above description was made from Panamanian and Costa Rican material at MO.

All collections of this species except for that from El Valle by Seibert are from upland Chiriqui, 1,500–2,000 m, an area from where no other species of *Mucuna* have been reported.

CANAL ZONE: Gatún Station, *Hayes 134* (GH). CHIRIQUÍ: Finca Collins, Boquete, *Blum & Dwyer 2531A* (GH, MO, SCZ). Cerro Horqueta, 4500–7000 ft, *Blum & Dwyer 2605* (FSU, SCZ); *Dwyer et al. 450* (MO); *Dwyer & Lallathin 8738* (GH, MO). Boquete, *Ebinger 740* (MO); *Kirkbride 156* (MO). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 324* (MO). Bajo Mono and Quebrada Chirquero, 1500 m, *Woodson & Schery 517* (MO). Casita Alta, Volcán de Chiriquí, *Woodson et al. 969* (GH, MO, US). COCLÉ: El Valle de Antón, 500–700 m, *Seibert 434* (GH, MO). DARIÉN: Between Caná and Boca de Cupe, *Stern et al. 628* (GH, MO).

33. MYROXYLON

Michael O. Dillon[71]

Myroxylon L.f., Suppl. Pl. 34, 233. 1781. Nom. cons., non J. R. & G. Forster, 1776. TYPE: *M. peruiferum* L.f.

Toluifera L., Sp. Pl. 384. 1753; Gen. Pl., ed. 5. 181. 1754. Nom. rejic. TYPE: *T. balsamum* L.
Myrospermum sect. *Myroxylon* (L.f.) DC., Prodr. 2: 95. 1825.

Unarmed *trees*. *Leaves* alternate, imparipinnate, 5–15 foliolate; leaflets alternate, with pellucid glandular dots and lines; stipules and stipels minute or absent. *Inflorescences* racemose, terminal and axillary; bracts and bracteoles caducous. *Flowers* pedicellate, small; calyx turbinate-campanulate, 5-lobed, subequal, valvate in bud; petals 5, whitish, subequal, free, the standard larger than the wings, the keel narrow; stamens 10, free, subequal, exserted, the anthers uniform, oblong, acuminate, sagittate, dorsifixed; ovary long stipitate, 2-ovulate near the apex, the style short, incurved, the stigma terminal, minute. *Fruits* stipitate, compressed, indehiscent, samaroid, 1-seeded at the apex, unequally winged basally; seeds subreniform, resinous, the hilum elliptic, subapical. Chromosomes: $n = 14$.

The genus *Myroxylon* is represented by 2 species distributed from Mexico to northern South America and cultivated in Ceylon and the Congo. In Panama, *M. balsamum* is known from tropical moist forest in the Canal Zone, Panama and Darien Provinces. Rudd (1972) recognized two varieties in Panama (*balsamum*

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and *pereirae* (Royle) Harms) with the note that the most important differences between the varieties seemed to be the chemical and physical properties of the balsam. In the absence of morphological characters allowing distinction of these varieties, they are not recognized in the present treatment.

Myroxylon supplies the "balsam of Peru" used pharmaceutically and in perfumery. Despite its most common name, it was originally discovered and has since been produced commercially in El Salvador. The wood is strong and durable, and it is used for cabinet work. In addition to commercial uses, this species is utilized by native peoples for poles in house construction, "orcones" and "pilones." The Choco of Darién call this plant "pido quera," which translates to peccary perfume; the bark is burned in the sun to attract these animals. The fruits are not consumed.

Literature:

Baillon, M. H. 1873. Sur les toluifera et sur l'origine des baumes de Tolu et du Pérou. Assoc. Franc. l'Avanc. Sci., Lyon, 510–521, plate X.

Ruiz, H. 1777–1788. Travels of Ruiz, Pavón, and Dombey in Peru and Chile (1777–1788). English translation, Publ. Field Mus. Nat. Hist., Bot. Ser. 21: 176–177. 1940.

1. **Myroxylon balsamum** (L.) Harms,[72] Notizbl. Bot. Gart. Berlin 5: 94. 1908.—FIG. 38.

Toluifera balsamum L., Sp. Pl. 384. 1753. TYPE: Colombia, "in America prope Carthagenam," collector unknown (presumably BAS, not seen).

Tree to 40 m tall, d.b.h. ca. 1 m; bark smooth, with abundant lenticels. *Leaves* usually imparipinnate, 5–10 foliolate; rachis and petiolules pubescent, terete; rachis 5–15 cm long; leaflets alternate, lanceolate to elliptic, acute to acuminate, obtuse at the base, 3–11 cm long, 1.8–4.0 cm wide. *Inflorescence* racemose, axillary, to 20 cm long, closely cinereous tomentose; pedicels 1.0–1.5 cm long. *Flowers* oblique on the pedicel; calyx campanulate, 1.5–4.5(–6.0) mm long, finely ribbed, the lobes ca. 1.5 mm long; the standard orbicular, ca. 9 mm in diameter, cordate basally, the claw ca. 1 mm long; wings elliptic to narrowly spatulate, ca. 1 cm long, ca. 4 mm wide, the claw 2 mm long; keel subelliptic, ca. 8.5 mm long, ca. 3 mm wide, the claw ca. 1.5 mm long; ovary short stipitate for ca. 2 mm, villosulose; style subulate. *Fruit* a samara, narrowly obovate, to 11 cm long, glabrous, stipitate, ca. 1 cm long; wing to 8 cm long, 1–2 cm wide, the seminiferous area turgid at the apex of the fruit, obliquely oblong, 2–3 cm wide, ca. 1 cm thick.

This species ranges from southern Mexico to northern South America, where it is replaced by *Myroxylon peruiferum* L.f., which ranges south to Argentina. In Panama, it flowers from January to June, fruiting between September and March.

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[72] For a list of synonyms see Rudd (1972). Only the listed names have been used for Panamanian material.

FIGURE 38. *Myroxylon balsamum* (L.) Harms.—A. Habit (×½).—B. Fruit (×½).

DARIÉN: Santa Fé, *Duke 8391* (MO); Campamento Buena Vista, *Stern et al. 856* (MO). PANAMÁ: Chepo. *Pittier 4765* (MO).

34. ORMOSIA

Michael O. Dillon[73]

Ormosia Jacks., Trans. Linn. Soc. London 10: 360. 1811. Nomen cons. TYPE: *O. coccinea* (Aubl.) Jacks. (=*Robinia coccinea* Aubl.).

Trees to 60 m, or rarely shrubby; trunks sometimes buttressed, bark gray, rough. *Leaves* imparipinnate, 3–19 foliolate, occasionally unifoliolate; leaflets coriaceous or subcoriaceous, 1.5–35.0 cm long, 0.5–20.0 cm wide; rachis to 50

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cm long; stipules 0.5–15.0 mm long, deltoid to linear, caducous, possibly lacking in some species; stipels rare, minute, usually acicular. *Inflorescence* racemose, many flowered, terminal or pseudoterminal; bracts stipuliform, deltoid to lanceolate, 0.5–10.0 mm long, 0.5–4.0 mm wide, pubescent, frequently caducous; bracteoles paired, subtending the calyx, deltoid to filiform, 0.5–8.0 mm long, 0.5–1.0 mm wide. *Flowers* yellow, lilac, or dark purple; calyx campanulate, 5-lobed, upper 2 lobes subconnate; petals 5, free, the standard suborbicular, wings oblique, obovate to oblong, the keel similar to wings, incurved, free, often overlapping dorsally; stamens 10, free, alternately subequal; anthers versatile. *Fruit* 1–6 seeded, oblong or rarely elongate, compressed or turgid around seeds, dehiscent or rarely indehiscent, woody or fleshy, 2-valved, continuous or with septa between seeds; seeds ellipsoid, globose or lenticular, unicolored, red, yellow, or black, or bicolored, red and black or yellowish and red, the hilum terminal, elliptic or linear; chromosomes: $n = 8$.

Ormosia is a genus of some 100 species, approximately half of which are American tropical rain forest elements and the remainder of the Old World. This Asian-American disjunct distribution is curious, with no single species common to both hemispheres. In Panama, six species are recognized, two of these endemic, *O. panamensis* and *O. cruenta*, with the other four distributed south to Brazil. While *Ormosia isthmensis* Standl., described originally from Oaxaca, has been reported from Panama (Rudd, 1965), all specimens annotated as such are referable to other taxa, usually *O. macrocalyx* Ducke or *O. coccinea* var. *subsimplex* (Spruce ex Benth.) Rudd.

While lacking major economic importance, most species do yield wood of good quality. In Panama, various species are used locally for building and furniture construction. This genus finds greatest importance among native peoples for personal adornment and medicinal preparations. The bright red seeds are used in necklaces, hence the common name "necklace tree."

Leaves, bark, and roots are used alone or in combination with other drug plants for a wide variety of ailments and maladies. In eastern Venezuela, *Ormosia monosperma* ("pionia montañero") is utilized as follows: "the seed used by doctor; cook seed and drink for pains of the heart; also cooked seed placed in water, given to children to put around their necks for sore throat" (collectors notes, *Steyermark 61330* [MO]).

Seeds of several species have been tested as possible drug sources. The alkaloids ormosine and ormosonine have been isolated, possibly from *O. avilensis* or *O. venezolana*, with the former reportedly having a physiological effect resembling morphine (Hess & Merck, 1919). *Ormosia macrocalyx*, originally identified as *O. panamensis*, has yielded the alkaloid panamine, which induced hypotensive action in test dogs (Lloyd & Horning, 1958).

Literature:

Hess, K. & F. Merck. 1919. Über Ormosin und Ormosinin, zwei neue Alkaloide aus *Ormosia dasycarpa*. Ber. 52: 1976–1983.

Lloyd, H. A. & E. C. Horning. 1958. Alkaloids of *Ormosia panamensis* Benth. and related species. Amer. Chem. J. 80: 1506–1510.

Rudd, V. E. 1965. The American species of *Ormosia* (Leguminosae). Contr. U.S. Natl. Herb. 32(5): 279–384.

a. Mature leaflets glabrous beneath (inconspicuously pubescent in *O. panamensis*), secondary veins not conspicuously raised; mature fruits essentially glabrous, seeds unicolored red.
  b. Leaflets 2–6(–8) cm long, 1.0–3.5 cm wide (Panama) ..... 3. *O. cruenta*
  bb. Leaflets 6–15 cm long, 3–10 cm wide.
    c. Fruit submolliform, constricted between seeds, black or dark brown, shiny, glabrous, septa lacking between seeds (Mexico to Brazil) ..... 4. *O. macrocalyx*
    cc. Fruit suborbicular, not constricted between seeds, yellow sericeous, glabrate, seeds separated by septa (Panama) ..... 5. *O. panamensis*

aa. Mature leaflets pubescent beneath, secondary veins conspicuously raised; mature fruits pubescent or glabrous, seeds bicolored red and black.
  d. Mature fruit densely puberulent, not shiny; leaflets reddish pubescent beneath (Panama, Colombia, Venezuela) ..... 6. *O. tovarensis*
  dd. Mature fruit glabrous; pubescence white (Panama, northern South America).
    e. Leaflets with lower surface sparsely pubescent with minute appressed trichomes (Panama, northern South America) ..... 2a. *O. coccinea* var. *subsimplex*
    ee. Leaflets with lower surface finely and tightly crisped-pubescent (Panama, Amazonian Basin) ..... 1. *O. amazonica*

1. **Ormosia amazonica** Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 139. 1922. TYPE: Brazil, Para: Obidos, *Ducke 14833* (G, holotype, not seen; MO, photo).

Ormosia euneura Harms, Notizbl. Bot. Gard. Berlin 9: 972. 1926. TYPE: Peru, Loreto, Iquitos, *Tessmann 3665* (fragment, F; photo neg. #1908, MO).

Tree to ca. 20 m; young stems greyish to yellowish tomentulose. *Leaves* 7–11-foliolate; rachis 14–40 cm long, tomentulose; petiole 7–12 cm long; petiolules 5–10 mm long; leaflets coriaceous, elliptical, ovate, or obovate, 15–22 cm long, 6.0–11.0 cm wide, the apex obtuse, short acuminate, the base rounded to cordate, the margin sometimes revolute, glabrous above, finely and tightly crisped-pubescent beneath. *Inflorescence* terminal, the axes yellowish tomentulose. *Flowers* purplish, 15–17 mm long; calyx 8–10 mm long, yellowish to reddish tomentulose, 5-lobed, the teeth 4–6 mm long. *Fruit* dehiscent, subligneous or coriaceous, glabrate, black to dark brown, 1–3-seeded, 2–5 cm long, 1.5–2.5 cm broad; seeds bicolored, red with a black spot; 10–13 mm long, 9–11 mm wide, 7–8 mm thick.

This species was recently collected in Panama on Barro Colorado Island, Canal Zone. Although sterile, the collection is best referred to this taxon until flowering material is available for study. Previously it had been known only from the Amazonian Basin of Brazil and Peru, and its occurrence north of the equator marks a considerable range extension.

Inflorescence, flower and fruit characteristics are taken from Rudd (1965).

Ormosia amazonica is distinctive among the Panamanian species with its large leaves and leaflets with upper surfaces glabrous and lower surfaces finely and tightly crisp-pubescent.

CANAL ZONE: Barro Colorado Island, *Foster 2866* (MO).

2. **Ormosia coccinea** (Aubl.) Jacks., Trans. Linn. Soc. London 10: 360. 1811.

2a. **Ormosia coccinea** var. **subsimplex** (Spruce ex Benth.) Rudd, Contr. U.S. Natl. Herb. 32: 328. 1965.

Ormosia subsimplex Spruce ex Benth., Mart. Fl. Bras. 15(1): 316. 1862. TYPE: Venezuela, Amazonas, San Carlos, *Spruce 2955* (K, holotype, not seen).

Tree, to ca. 30 m; trunk commonly 60(–100) cm d.b.h., outer bark thin, hard, reticulate, flaking easily; stems subflexuose, reddish to yellowish tomentulose, glabrescent. *Leaves* imparipinnate, 9(–14)-foliolate, 25–40 cm long; rachis 8–30 cm long, tomentulose to subsericeous, the petiole 6–10 cm long; leaflets coriaceous, elliptic, oblong to obovate, 7–18 cm long, 4.0–7.5 cm wide, abruptly acuminate, obtuse to subcordate basally, glabrous above, somewhat shiny, the lower surface sparsely pubescent with minute, appressed trichomes, somewhat viscid, the costa tomentulose. *Inflorescence* cymose-paniculate, terminal, to 30 cm long, axes yellowish to reddish tomentulose, glabrescent. *Flowers* purple, 10–15 mm long; calyx yellowish or reddish tomentulose, 7–9 mm long, 5-lobed, the teeth 3–5 mm long; corolla 10–15 mm long. *Fruit* dehiscent, woody, black or dark brown, glabrous at maturity, shiny, usually 1 or 2 seeded, oblong or obovate, 3.5–5.0 cm long, 2.0–2.5 cm wide, abruptly narrowed at the apex, the valves 2–3 mm thick; seeds bicolored, red and black, 10–15 mm long, 9–12 mm wide, 7–10 mm thick.

This variety is distributed in tropical moist forest from Panama to Colombia, Peru, Venezuela, and Brazil, with variety *coccinea* found in northern Brazil and adjacent French Guiana, Surinam and British Guiana. Variety *subsimplex* is readily recognized among the Panamanian taxa by its large, coriaceous, glabrescent leaflets, woody 1–2-seeded fruits and bicolored seeds. It flowers from June to August and fruits mature in 4–6 weeks. The fruits and exposed seeds persist until flowering the following year. It is known locally as "alcornoque" or "pernillo de monte."

CANAL ZONE: Near Indio Tower, *Johnston 1793* (A). San Pablo, collector unknown *9.267* (US). BARRO COLORADO ISLAND: *Croat 5104* (MO, SCZ, US), *5120* (MO, NY, SCZ, US), *6577* (F, MO, NY, SCZ, US), *8112* (MO), *8440* (MO, US), *10395* (MO, NY), *11306* (MO), *12685* (MO, NY), *12702* (MO); *Foster 1114* (PMA); *Shattuck 1103* (F, MO, US). VERAGUAS: Isla de Coiba, *Dwyer 1617* (GH), *2373* (F, MO, NY, PMA).

3. **Ormosia cruenta** Rudd, Contr. U.S. Natl. Herb. 32(5): 318. 1965. TYPE: Panama, *Davidson 848* (US, holotype; A, F, MO, isotypes).

Tree, to 30 m tall; stems reddish tomentose. *Leaves* imparipinnate, 5–11 foliolate, the rachis 8–10 cm long, velutinous, glabrescent; petioles ca. 2 cm long; leaflets subcoriaceous, elliptic to elliptic-oblong, 2–8 cm long, 1.0–3.5 cm wide, the apex acute, obtuse basally, glabrous above, shiny, glabrous below, somewhat shiny. *Inflorescence* racemose, terminal, axes reddish velutinous. *Flowers* 15–18 mm long; calyx reddish velutinous, ca. 10 mm long, 5-lobed, the teeth ca. 4 mm long; petals lilac; ovary subsessile, reddish villous, 3–5-ovulate. *Fruit* dehiscent, sublignous, glabrous, somewhat shiny, black, 1-seeded, 2.0–2.5 cm long, 1.5 cm wide, 1 cm thick; seeds red, 8–10 mm long, 9–10 mm wide, 7–9 mm thick, the hilum ca. 2 mm long, ca. 1.5 mm wide.

This species is only known from the mountains of western Panama at 800–1,300 m. It is distinctive among the Panamanian species with its small leaflets and legumes.

A collection (*Lindsay 481* [MO]) from the Canal Zone Experimental Garden

appears to be *Ormosia cruenta*; however, its leaflets are more acuminate than other collections examined.

CHIRIQUÍ: Boquete, *Davidson 848* (A, F, MO, US). COCLÉ: Cerro Pajita, *Allen 4499* (F, GH, MO, NY, US).

4. **Ormosia macrocalyx** Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 137. 1922. TYPE: Brazil, Amazonas: Lago Teffe, *Ducke 7345* (BM, isotype, not seen).

O. toledoana Standley, Carnegie Inst. Wash. 461: 64. 1935. TYPE: British Honduras, Toledo: Forest Home, *Schipp 1052* (holotype F; isotype MO).
O. chlorocalyx Ducke, Bol. Técn. Inst. Agron. N. 2: 23. 1944. TYPE: Brazil, Amazonas: Esperanca, Rio Solimoes, "boca do Javari," *Ducke 1516* (isotypes F, MO).

Tree to ca. 40 m; young stems finely pubescent, glabrate. *Leaves* 7–11-foliolate; rachis 15–40 cm long; petiole 4–10 cm long, conspicuously swollen at the base; petiolules pulvinate, 5–8 mm long; leaflets ovate to ovate-oblong, 6–15 cm long, 4–10 cm wide, glabrous, the apex obtuse to short acuminate, rounded to subcordate basally. *Inflorescence* terminal, paniculate, to 30 cm long, greyish to yellowish pubescent, the bracts linear, 3–10 mm long, ca. 1 mm wide, the bracteoles subulate, 1.0–1.5 mm long. *Flowers* purplish, 18–25 mm long; calyx 8–15 mm long, grayish pubescent, 5-lobed, the teeth 3–5 mm long; petals ca. 2 mm long; standard minutely biappendiculate basally. *Fruit* dehiscent, coriaceous, circular to oblong, flattened, to ca. 10 cm long, ca. 3 cm wide, 1–4-seeded, the lateral margins straight or submolliform, glabrous; seeds red, ovoid, ca. 1 cm long, ca. 10 mm broad, ca. 8 mm thick, the hilum elliptic. Chromosomes: $n = 8$.

This species is distributed from southern Mexico to the Amazon Basin of Brazil, usually in moist forests up to 100 m. In Panama it is known from tropical moist forest in the Canal Zone, Bocas del Toro, and Veraguas, and from premontane wet forest in Chiriqui Province. It appears to flower during mid-rainy season, with the fruits persisting most of the year. A chromosome number of $n = 8$ was reported by Atchison for *O. macrocalyx* as *O. panamensis*.

BOCAS DEL TORO: *Cooper & Slater 125* (A, GH, US). CANAL ZONE: Cascadas Road near Summit, *Avilla 407* (MO, SCZ). Barro Colorado Island, *Croat 13217* (F, MO, US). Highway near Fort Kobbe, *Dwyer 2666* (MO). Curundu, *Dwyer & Robyns 6* (MO). Barro Colorado Island, *Foster 2091* (GH, PMA, US). Tropical Test Center Site, Chiva Chiva Trail, *Gentry 6335, 8751* (both MO). Corozal area, *Mori & Kallunki 3063* (MO, US). Corozal cemetery, *Schubert & Lindsay 602* (GH, US). Fort Clayton, *Tyson 3472* (SCZ). Corozal area, *Tyson & Dwyer 2789* (FSU, MO, SCZ). CHIRIQUÍ: Progreso, *Cooper & Slater 243* (F, GH, NY, US). PANAMÁ: Alrededores del Hotel Panamá, 8 Mar 1971, *Holdridge* (PMA). VERAGUAS: Santiago, *Dwyer 1347* (MO, SCZ).

5. **Ormosia panamensis** Benth., Seem. Bot. Voy. Herald 111, *fig. 5*. 1854. TYPE: Panama, *Seemann 1673* (K, holotype, not seen; BM, isotype, not seen; MO, photo).—FIG. 39.

O. stipitata Schery, Ann. Missouri Bot. Gard. 30: 90, *fig. 2*. 1943. TYPE: Panama, *White 306* (holotype, MO).

Tree to ca. 15 m tall; young stems yellowish or golden sericeous, glabrate. *Leaves* 5–9-foliolate, the rachis 9–17 cm long, sparsely pubescent, glabrate, the petiole 5–8 cm long; leaflets subcoriaceous, oblong-lanceolate, gradually long

FIGURE 39. *Ormosia cruenta* Rudd.—A. Habit (×½).—B. Flower with one wing petal removed (×1½). [After *Allen 4999.*]—C. Fruit (×½). [After *Davidson 848.*]

acuminate at the apex, obtuse basally, 10–15 cm long, 3–6 cm wide, glabrate above, inconspicuously golden puberulent below. *Flowers* lilac; calyx densely yellowish sericeous, 8–11 mm long, 5-lobed, the teeth 3–4 mm long; corolla ca. 2 cm long. *Fruit* dehiscent, coriaceous, yellowish sericeous, glabrate; light brown or yellowish, suborbicular when mature, flattened, ca. 4 cm in diameter, not constricted between seeds, the valves thick with an adnate margin, 5–15 mm wide; seeds 1–4, separated by septa, ca. 1.5 cm long, dark red.

This species is only known from Panama, and it appears rare locally in Bocas del Toro, Chiriqui, and Barro Colorado Island, Canal Zone. Its dehiscent, coriaceous legume, lacking constrictions between the seeds, is distinctive among the Panamanian species. It is unique among the American species in possessing septae between the seeds, a character also found in some Asiatic species. It is known locally as "peronil."

BOCAS DEL TORO: Talamaca Valley, near Almirante, *Cooper & Slater 150* (US). CANAL ZONE: Barro Colorado Island, *Foster 1128* (F, MO, PMA, SCZ). 1 km N of Gamboa near summit of Cerro Pelado, *Nee 9060* (MO). CHIRIQUÍ: Near David on road to Gualaca, *Birdsall* (US); *Holdridge 2* (US); *Roy* (US).

6. **Ormosia tovarensis** Pittier, Bol. Soc. Venez. Ci. Nat. 4: 85. 1938. TYPE: Venezuela, Distrito Federal: El Avila, *Delgado 59* (VEN, holotype; F, isotype).

Tree to ca. 25 m; young stems yellowish to reddish tomentose. *Leaves* 7–9-foliolate, the rachis 12–36 cm long, reddish tomentose, the petiole 4–15 cm long, reddish tomentose, the petiolules 3–10 mm long, reddish tomentose, the leaflets

coriaceous, elliptic, oblong-elliptic or obovate, 8–30 cm long, 1–18 cm wide, rounded at each end, the margins often revolute, the upper surface glabrous, densely reddish pubescent with moderately crispate hairs beneath, the secondary veins raised. *Inflorescence* terminal, the axes reddish tomentose, the bracts deltoid, 5–6 mm long, the bracteoles linear-deltoid, ca. 2 mm long. *Flowers* 15–16 mm long, violet; calyx reddish tomentulose, 10–11 mm long, 5-lobed, the teeth 4–5 mm long; ovary yellowish pubescent with crispate hairs. *Fruit* yellowish to reddish velutinous, 1–3-seeded, 4–9 cm long, 3–4 cm wide, ca. 2 cm thick, the valves ligneous; seeds bicolored red and black, 15–22 mm long, 13–19 mm wide, 10–18 mm thick, the hilum 3.0–3.5 mm long.

This species was previously known from the rain forests of the coastal cordillera of Venezuela and the Cordillera Oriental of Colombia, and its occurrence on Cerro Tacarcuna, Darien, marks its northwestern extreme in distribution. On Cerro Tacarcuna it occurs in elfin forest between 1,800–1,850 m.

The specimens cited here are sterile and are only tentatively being assigned to *O. tovarensis* on the basis of leaflet size, shape and pubescence. Inflorescence, flower and fruit characteristics are taken from Rudd (1965). Fruiting material may prove this to be another or perhaps a new species.

DARIÉN: Top of W peak of Cerro Tacarcuna, *Gentry & Mori 13988* (MO). Headwaters of Tacarcuna River, *Holdridge* (US).

35. PACHYRHIZUS

W. G. D'Arcy[74]

Pachyrhizus Rich. ex DC., Prodr. 2: 402. 1825. TYPE: *P. angulatus* Rich. ex DC. = *P. erosus* (L.) Urb., nomen & typus cons. vs. *Caraca* Thou.

Caraca Thou., Dict. Sci. Nat. 6: 35. 1805 [?1806]. Nomen rejic. vs. *Pachyrhizus* DC. Based on *Dolichos bulbosus* L.

Taeniocarpum Desv., Ann. Sci. Nat. 9: 420. 1826. TYPE: *T. articulatum* (Lam.) Desv. = *Pachyrhizus erosus* (L.) Urb.

Robynsia Mart. & Gal., Bull. Acad. Bruxelles 10(2): 193. 1843. non Drapiez 1841, nec Hutch. 1931. TYPE: *R. macrophylla* Mart. & Gal. = *Pachyrhizus erosus* (L.) Urb.

Twining annual or perennial *vines*; stems terete; roots tuberous. *Leaves* pinnate trifoliolate; leaflets entire, lobed or deeply dissected, stipels subulate, stipules caducous, rachis and petioles with longitudinal ridges running onto the stipels. *Inflorescences* axillary pseudoracemes, the peduncle often longer than the petiole, the flowers somewhat congested apically; bracteoles subulate, shorter than and subtending the calyx; pedicels slender, slightly longer than the calyx. *Flowers* blue; calyx campanulate tubular, 2-lipped, the upper 2 teeth mostly connate, the lower teeth acute, shorter than the tube; standard emarginate with 2 basal incurved auricles, the wings auriculate, medially adherent to the keel, the keel equalling the wings; stamens diadelphous, the anthers 10, elliptical, dorsifixed; ovary subsessile, multiovulate, the style incurved, sometimes forming a circle, dorsally glabrous, bearded the full length of the ventral, incurved surface. *Legume* oblong, compressed, nearly straight, internally septate between the seeds; seeds globose, compressed.

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Pachyrhizus is distinguished by its curved, ventrally pubescent style, often lobed leaves, flowers which are not resupinate, and tuberous roots. Although treated here as monotypic, Clausen (1946) adopted a narrow species concept and recognized six species and several varieties.

The genus was widely cultivated in pre-Columbian times and ranges throughout the Neotropics, occurring mainly at lower and middle elevations. It has been introduced to the Old World and is naturalized there. The tubers of *Pachyrhizus* are cultivated for food in many tropical countries and the plants are sometimes cultivated for forage. The seeds are reported to be toxic.

1. **Pachyrhizus erosus** (L.) Urban, Symb. Ant. 4: 311. 1905.—FIG. 40.

Dolichos erosus L., Sp. Pl. 2: 726. 1753. TYPE: ?Herb. Linnaeus (LINN 900.11 not seen; microfiche MO).
D. bulbosus L., Sp. Pl., ed. 2. 1021. 1763. Renaming of *D. erosus* L.
D. articulatus Lam., Encycl. Méth. Bot. 2: 296. 1786. Based on Plumier, Plant. Amer. *tab. 220*. 1755.
Pachyrhizus angulatus Rich. ex DC., Prodr. 2: 402. 1825. Renaming of *Dolichos bulbosus* L.
Stizolobium bulbosum (L.) Spreng., Syst. Veg. 3: 252. 1826.
S. domingense Spreng., Syst. Veg. 3: 525. 1826. Based on *Dolichos articulatus* Lam.
Taeniocarpum articulatum (Lam.) Desv., Ann. Sci. Nat. 9: 421. 1826.
Robynsia macrophylla Mart. & Gal., Bull. Acad. Bruxelles 10(2): 193. 1843. LECTOTYPE: Mexico *Galeotti 3278* (BR, not seen).
Pachyrhizus articulatus (Lam.) Duch. & Walp., Flora 36: 226. 1853.
P. bulbosus (L.) Kurz, Asiat. Soc. Beng., J. 45(2): 246. 1876. (not seen.)
Cacara erosa (L.) Kuntze, Rev. Gen. Pl. 1: 165. 1891.
Pachyrhizus panamensis Clausen, Cornell Univ. Agric. Exp. Sta. Mem. 264: 21. 1944 [1945]. TYPE: Panama, *Killip 12080* (US, holotype; isotypes GH, NY).
P. vernalis Clausen, Cornell Univ. Agric. Exp. Sta. Mem. 264: 23. 1944. [1945]. TYPE: Guatemala, *Steyermark 38553* (F, not seen).

Herbaceous *vines*; stems pilose, often drying hollow; rootstock tuberous. *Leaves* pinnate trifoliolate, the leaflets ovate to broadly ovate, the terminal leaflet broadest and often 3–7 lobed, the sinuses and lobes acute or rounded, mucronate, the lateral leaflets oblique, often less lobed or entire, basally deltoid, 3-veined from the base, drying slightly discolorous, glabrate or densely soft tomentose; petiolules 4–5 mm long, stout, pilose; petioles and rachis slender, drying angled, pubescent; stipels 1–2 mm long, acicular, sericeous, basally extended into definite ribs on the rachis; stipules minute, caducous. *Inflorescences* axillary pseudoracemes, mostly 12–20 cm long, the flowers congested near the apex, the peduncle mostly longer and stouter than the petioles, the bracteoles resembling the stipels, subtending and much shorter than the calyx; pedicels ca. 2 per node, slender, ca. 5 mm long. *Flowers* blue, calyx 5–8 mm long, tubular, 2-lipped, the upper 2 teeth mostly connate, the lower 3 acute or acuminate, shorter than the tube, subequal or the lowermost longest and acuminate; standard ca. 15 mm long, suborbicular, emarginate, the wings and the keel about as long as the standard, sometimes ciliolate. *Legume* oblong, ca. 10 cm long, 1.5–2 cm wide, compressed, appressed strigose.

This species is distinct in its broad, often lobed leaflets and in its tuberous roots. In Panama, upland populations are generally densely pubescent while plants from the lowlands are glabrate. Clausen (1947) distinguished the more pubescent plants as *Pachyrhizus panamensis*, noting that petals of these plants

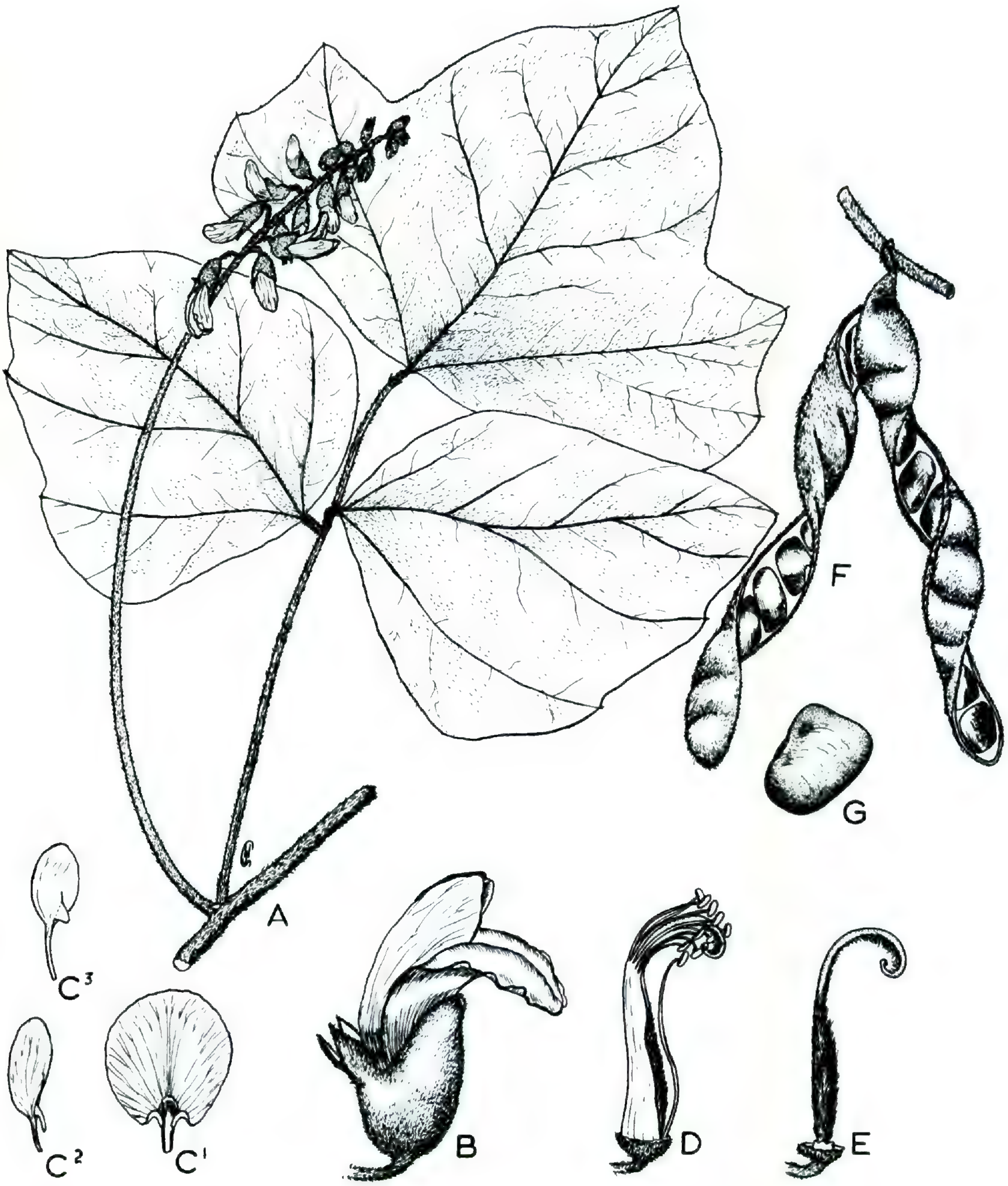

FIGURE 40. *Pachyrhizus erosus* (L.) Urban.—A. Habit (×½).—B. Flower (×2).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petal (×1).—D. Stamens (×2).—E. Pistil (×2). [After *Allen 2027.*]—F. Fruit (×½).—G. Seed (×1½). [After *Greenman 5053.*]

are usually ciliolate. However, these differences are not of specific import. By coincidence, the specimen he selected for the type of his species is an unusually pubescent species from Ancon Hill in the lowlands, thus the distinction between upland and lowland races is not absolute.

Pachyrhizus erosus ranges throughout the Neotropics and has been introduced and naturalized in parts of the Old World. It is cultivated for its edible tubers, but many of the Panamanian collections appear to have been taken from the wild.

The seeds are toxic. The species is known in English as the *Yam Bean*, and in Spanish as *Jícama*.

BOCAS DEL TORO: Big Bight, Chiriquí Lagoon, *Wedel 2981* (GH, MO, US). CANAL ZONE: Fort Kobbe, *Allen 2027* (F, GH, MO, NY, US). Ancón, *Celestine 28* (US). Fort Sherman, *Dwyer & Robyns 132* (MO). Chagres, *Fendler 74* (MO), *75* (F, GH, US). Balboa Heights, *Greenman & Greenman 5053* (MO). Cerro Ancón, *Heriberto 117* (GH, US). Ancón Hill, 100–200 m, *Killip 12080* (GH, NY, US). Madden Dam, 50 ft, *Lewis et al. 29* (MO). Junction Chagres Boy Scout Road and Madden Dam Road, *Mori et al. 4070* (MO, WIS). Madden Dam, *Nee 7774* (MO). Cerro Ancón, *Standley 25200* (US). Sosa Hill, Balboa, *Standley 25271* (US). Gatún, *Standley 27281* (US). Mount Hope Cemetery, *Standley 28798, 28803* (both US). Between France Field and Catival, *Standley 30213* (US). Curundú, *Tyson & Blum 2534* (FSU, MO). CHIRIQUÍ: Quebrada del Medio 2 km N of Punta de Burica, 40–80 m, *Busey 747* (MO). Quebrada Guanabanito 2 mi SW of Puerto Armuelles, *Croat 22071* (DUKE, F, MO). Burica Peninsula above Quebrada Yerbazales, 200 m, *Croat 22586* (MO). Bajo Mono, Boquete District, *Davidson 496* (US). Boquete, *Lewis et al. 618* (MO); *Pittier 2918* (GH, NY, US). COLÓN: Río Guanche, *D'Arcy 9721* (MO). LOS SANTOS: 16 mi S of Macaracas at Quebrada Bejuco, *Tyson et al. 3091* (MO, SCZ). PANAMÁ: Isla de Pedro Gonzales, *Dwyer 1720* (MO). SE side of Madden Lake near Puente Natural, 90 m *Nee & Hansen 14046* (MO, WIS). Ruins of Old Panama, *Pease 22878* (GH). SAN BLAS: Mainland opposite Achituppu, *Lewis et al. 102* (GH, MO, US).

36. PHASEOLUS

James A. Lackey[75] & W. G. D'Arcy[76]

Phaseolus L., Sp. Pl. 723; Gen. Pl., ed. 5. 323. 1754. TYPE: *P. vulgaris* L.

Vines, *herbs* or *subshrubs*. *Leaves* pinnate trifoliolate, the leaflets mostly entire, pubescent or glabrate but minute, uncinate hairs present, the stipels often oblong, thin, glabrous; stipules acute, nervate, often pubescent, not prolonged below the insertion. *Inflorescences* axillary, the flowers congested in fascicles along the rachis, the nodes not swollen, not glandular, the rachis eglandular; bracteoles ovate or greatly reduced and much shorter than the calyx, nervate, puberulent, persistent at least until anthesis; bracts ovate or lanceolate, nervate, puberulent; pedicels mostly longer than the calyx. *Flowers* blue, purple, violet, yellow or white; calyx mostly 2-lipped, the upper teeth partly united; standard symmetrical, orbicular, basally appendaged, the wings partly spiralled, apically cucullate, the keel in 2–3 spirals; vexillary stamen free, the free part of the others elongate, the anthers nearly uniform; ovary 1–many ovulate, the style apically thickened, curved in 1.5–2.5 spirals, hairy inside, distally caducous. *Legume* linear or oblong, straight or slightly curved, not septate, compressed or turgid, sometimes beaked; seeds 1–many, oblong to reniform, the hilum short and central.

Phaseolus includes about 50 species, all of the New World, although under older circumscriptions, the genus may embrace 100–300 species.

In Panama, *Phaseolus* is a genus of both uplands and of low elevations. Various members of the genus are widely cultivated for food in both temperate and tropical countries.

a. Bracts conspicuous, foliaceous, more than 5 mm long; inflorescences dense, many flowered; pods pubescent.

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b. Bracteoles longer than the calyx; flowers bright red (white), 16–25 mm long; lowest calyx tooth conspicuously more tomentose than the others; pod more than 6 cm long; stipels more than 4 mm long; cultivated species ..... 1. *P. coccineus*
bb. Bracteoles minute, shorter than the calyx; flowers red to purple (white), 11–15 mm long; lowest calyx tooth only slightly pubescent, hardly more so than the others; pod less than 6 cm long; stipels less than 4 mm long; native species ..... 3. *P. tuerckheimii*

aa. Bracts inconspicuous, minute, less than 5 mm long; inflorescences open, few flowered; pods mostly glabrate.
c. Pod straight, narrow, mostly 5–10 seeded; peduncle less than 1 cm long; flowers more than 10 mm long, the standard glabrate outside with a few hairs on the midvein; stipels more than 1.5 mm long ..... 4. *P. vulgaris*
cc. Pod curved, broad, mostly 2–4 seeded; peduncle more than 2 cm long; flowers less than 10 mm long, the standard scattered pubescent outside; stipels less than 1.5 mm long ..... 2. *P. lunatus*

1. **Phaseolus coccineus** L., Sp. Pl. 724. 1753. TYPE: Herb. Linnaeus (LINN 899.2, not seen; microfiche MO).

P. formosus H.B.K., Nov. Gen. Sp. Pl. 6: 449. 1823. TYPE: near Toluca, Mexico, not seen.
P. obvallatus Schlecht. Linnaea 12: 328. 1838. TYPE: Mexico, *Ehrenberg* not seen.
Phaseolus coccineus ssp. *obvallatus* (Schlecht.) Maréchal et al., Taxon 27: 199. 1978.
P. multiflorus Lam., Encycl. Méth. Bot. 3: 70. 1789. Renaming of *P. coccineus* L.
P. polyanthus Greenm., Publ. Field Columbian Mus., Bot. Ser. 2: 253. 1907. TYPE: Mexico, *Barnes et al. 20* (F, not seen).
Phaseolus coccineus ssp. *polyanthus* (Greenm.) Maréchal et al., Taxon 27: 199. 1978.

Herbaceous *vine*, often large, stems softly hirsute, somewhat glabrescent, becoming stout, ca. 2–3 mm thick. *Leaves* pinnate trifoliolate, leaflets broadly ovate, the lateral pair strongly oblique, mostly 6–10 cm long, 6–8 cm wide, apically acute or acuminate, basally truncate, subcordate or rounded, the venation conspicuous on drying, sparingly soft pubescent with long and short hairs; petiolules thick, 3–5 mm long, petioles mostly longer than the terminal leaflet, stipels conspicuous, 4–6 mm long, cucullate, striate and pubescent outside, pubescent basally within. *Inflorescences* elongate cymose pseudoracemes to 30 cm long, sparingly flowered proximally, somewhat congested apically, the rachis drying sharply angled and tomentulose, especially upwards, bracts subfoliaceous, conspicuous, to 1 cm long, linear to broadly ovate, often acute, sometimes acuminate; bracteoles 2, ovate, subtending and slightly exceeding the calyx; pedicels mostly straight, 15–18 mm long, much longer than the calyx, becoming somewhat woody in fruit. *Flowers* red to lavender, showy; calyx cupular, 10–13 mm long, glabrate except the lower tooth, the upper teeth united forming a hood, the lower teeth acute, the lowermost longest; standard, ca. 2 cm long. *Legume* oblong, somewhat falcate, ca. 10 cm long, 15 mm wide, compressed or slightly turgid, beaked, softly short pubescent; seeds 5–8.

This species is distinguished by its elongate pedicels, its paired ovate bracteoles, by its large, conspicuous stipels and by the ciliate to tomentose lowest calyx tooth. This species is usually recorded as having scarlet flowers, but in Panama collectors more often note lavender or magenta flowers.

In Guatemala this species is much cultivated for food, and in the United States it is cultivated for its showy flowers as 'Scarlet Runner Bean.'

CHIRIQUÍ: Central valley of Río Chiriquí Viejo, 1800–2000 m, *Allen 1397* (MO). Nueva Suissa, *Croat 13508* (F, MO, NY, PMA). Bajo Mono, Boquete District, 4500 ft, *Davidson 496* (MO). Río

FIGURE 41. *Phaseolus lunatus* L.—A. Habit (×3/5). [After *McDaniel & Tyson 12690.*]—B. Fruit (×3/5). [After *Burt & Koster* 3 Oct. 1971.]

Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9019* (MO, NY). Nueva Suissa near Audubon Society Cabin, *Gentry 5986* (MO). Cerro Punta, 6000 ft, *Tyson 7097* (PMA). 2 km W of La Garita, 3 km WNW of Cerro Punta, 2000 m, *Wilbur et al. 15292* (DUKE). Finca Lérida to Peña Blanca, 1750–2000 m, *Woodson & Schery 313* (MO). Casita Alta, Volcán de Chiriquí, 1500–2000 m, *Woodson et al. 918* (MO, NY, US).

2. **Phaseolus lunatus** L.,[77] Sp. Pl. 724. 1753. TYPE: not determined.—FIG. 41.

Erect, ascending or nearly prostrate slender *vine*, sometimes somewhat scandent, sometimes branched; stems pilose with weak hairs, glabrescent. *Leaves* pinnate trifoliolate, leaflets ovate to deltoidal, sometimes rhombic ovate, apically deltoid, blunt but mucronulate, basally broader, sometimes rounded, mostly 6–8 cm long, 4–6 cm wide, 3 veined from the base, the lateral veins distally arcuate, somewhat evanescent, mostly drying concolorous, the sparse minute pubescence mostly confined to the costa; petiolules 2–3 mm long, puberulent; rachis mostly 1.5–3 cm long; stipels minute but evident, persistent, mostly 0.5–1.0 mm long; petioles mostly longer than the terminal leaflet, glabrate or sparingly pubescent with weak, subappressed hairs at anthesis. *Inflorescences* axillary or lateral, short or elongate pseudoracemes to 25 cm long, the nodes often well spaced proximally, more condensed distally, the bracts mostly 2–3 cm long, acute, sericeous, inconspicuous, the rachis and the peduncle sparingly pilose, glabrescent; pedicels 1–4 per node, slender, 6–9 mm long; bracteoles mostly ca. 1 mm long, pubescent or not, 3-nervate, spathaceous, subtending the calyx less than ½ as long as the calyx. *Flowers* greenish or purplish, the calyx 2–3 mm long, the tube campanulate, the limb somewhat flaring, the lobes rounded or short deltoid, ciliolate; standard ca. 1 cm long, broad, flat, often puberulent externally, keel spiralled. *Legume* flat, slightly turgid around the seeds, falcate, 3–8 cm long, 1.5–2 cm broad, glabrate; seeds 2–4, reniform, compressed.

This species is distinct in its glabrate leaflets and pods, inconspicuous bracts and bracteoles, and short calyx teeth. It is represented by both cultivated and wild varieties which differ in seed size and, according to Marechal et al. (1978), in the wild forms having glabrous standards. The species is believed to be native to Central America and perhaps the Antilles, so some of the populations collected in Panama are probably native to the country. This species is commonly referred to as the *Lima bean* (English) or as *Habas* (Spanish).

CANAL ZONE: Isla Perico near Fort Amador causeway, *McDaniel & Tyson 12690* (MO). Sosa Hill, *Standley 25243* (US). Balboa, *Standley 25647, 30894* (both US). CHIRIQUÍ: Quebrada Guanabanito beyond La Represa 2 mi SW of Puerto Armuelles, 0–200 m, *Croat 22076* (MO). Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 318* (DUKE, F, MO, NY, PMA). HERRERA: Near Los Pozos, 20 m, *Burt & Koster,* 10 March 1971 (MO). PANAMÁ: Bella Vista, *Standley 25304* (US). Las Sabanas, *Standley 25932* (US). Tumba Muerto Road near Panamá, *Standley 29792* (US). Camino a Sardinilla, *Taylor 38* (PMA). VERAGUAS: Atalaya-Santiago, 100–200 m, *Koster 117* (MO).

3. **Phaseolus tuerckheimii** Donnell Smith, Bot. Gaz. 56: 54. 1913. TYPE: Guatemala, *Tuerckheim 1536,* not seen. Paratype: Costa Rica, *Pittier 10539* (US).

P. chiriquinus Standley, Contr. U.S. Natl. Herb. 18: 109. 1916. TYPE: Panama, *Pittier 3111* (US, holotype; isotype NY).

Herbaceous *vine*, sometimes high climbing; stems stout, sericeous, becoming softly short tomentulose, drying angled, to 3 mm thick. *Leaves* pinnate trifoliolate; leaflets ovate, sometimes narrow, mostly 4–7 cm long, apically acute or acuminate, basally rounded, drying somewhat discolorous, softly densely pubes-

[77] For a list of other names see Maréchal et al., 1978. Only this name has been used for Panamanian plants.

cent above and beneath, the veins elevated beneath, the minor venation sometimes drying reticulate; petiolules ca. 3 mm long, tomentose; petioles mostly shorter than the terminal leaflets, densely puberulent; stipels conspicuous, 2–3 mm long. *Inflorescences* mostly elongate pseudoracemes to 30 cm long, the basal portion devoid of flowers, the peduncle basally stout, narrowing and becoming more densely pubescent upwards; bracts subfoliaceous, linear to broadly ovate, to 7 mm long, sericeous; bracteoles linear, glabrate, caducous, ca. 1 mm long; pedicels slender, ca. 10 mm long with scattered long hairs. *Flowers* white to bright violet or purplish; calyx sericeous overall, ca. 4 mm long, the tube ca. 3 mm long drying with umbonate or wing-like longitudinal enations, the limb flaring somewhat, the teeth deltoid, ca. 3 mm long, the uppermost longest, acute; standard 1.5 cm long, the keel convolute, spiralled. *Legumes* oblong, compressed, slightly turgid around the seeds, ca. 4 cm long, densely tawny hirsute; seeds ca. 4.

This species is distinguished by its dense overall pubescence and by its subfoliaceous bracts and minute bracteoles. The fluting on the dried calyx is an interesting feature. *Phaseolus tuerckheimii* ranges from southern Mexico to Panama. In Panama it occurs only at upper elevations in Chiriqui Province where it is apparently shade tolerant and is found climbing on trees.

CHIRIQUÍ: Volcán de Chiriqui, Boquete District, 7500 ft, *Davidson 948* (MO). Río Chiriquí Viejo N of Volcán City, 5200–5600 ft, *Duke 9064* (MO). Cuesta de Cerro Quemado, E slope of Chiriquí Volcano, 1800–2160 m, *Pittier 3111* (NY). Cerro Punta, 6000 ft, *Tyson 7099* (PMA).

4. **Phaseolus vulgaris** L.,[78] Sp. Pl. 723. 1753. TYPE: ?India, Herb. Linnaeus (LINN 899.1, not seen; microfiche MO).

Climbing or trailing *vine* or erect *herb*; stems glabrous or pubescent. *Leaves* pinnate trifoliolate, the leaflets mostly ovate, sometimes broad, the lateral leaflets mostly oblique; glabrate to velutinous, apically acute, or acuminate, the petiolules 2–4 mm long, stout, pubescent; petioles often exceeding the terminal leaflet; stipels linear, costate, glabrous, as long as or shorter than the petiolules; stipules lanceolate, striate, glabrous. *Inflorescences* axillary, mostly 3–10 cm long; peduncle mostly slender and weak; rachis contracted; bracteoles and bracts spathaceous, exceeding the calyx, striate; pedicels slender. *Flowers* white, yellowish or purplish; calyx campanulate, the teeth rounded; standard 1–2 cm long. *Legume* linear, turgid, often slightly curved, glabrate, mostly 10–20 cm long; seeds subglobose to oblong, to 1.5 cm long, variously colored.

Phaseolus vulgaris, the well-known string bean or kidney bean in English, the frijol or the frijol negro in Spanish, is cultivated in almost every country in the world, and in some places it escapes and has naturalized. It is a native of the New World, and it was widely disseminated by pre-Colombian man. No collections have been seen from Panama, but the species is grown as a crop plant, mainly in upland areas, to judge from reports of vendors in markets and from fresh vegetables served in restaurants in Panama City from time to time. There

[78] No attempt has been made here to research synonyms for this widespread cultivated species.

is also a substantial import of frijoles negros from the United States and other countries for use as food.

This species is distinct from other species of *Phaseolus* in Panama in its long turgid pods and light colored flowers. Many races of *Phaseolus vulgaris* exist in cultivation, many of quite different appearance, and until specimens are obtained of the Panama elements it is not fruitful to try to amplify details of the above description or to indicate more features of difference. The above description was made from a range of cultivated material from Central America held at MO.

37. PUERARIA

W. G. D'Arcy[79]

Pueraria DC., Ann. Sci. Nat. 4: 97. 1824. LECTOTYPE: *P. tuberosa* (Willd.) DC.

Neustanthus Benth., in Miq., Pl. Jungh. 234. 1852. TYPE: *N. javanicus* Benth.
Glycine L., Sp. Pl. 753; Gen. Pl., ed. 5. 334. TYPE: *G. javanica* L. Nomen rejic. versus *Glycine* Willd. 1802.

Robust scrambling *vines*, sometimes high climbing, ?shrubs; stems herbaceous or woody, pubescent. *Leaves* pinnate trifoliolate, the leaflets large, entire, lobed or undulate margined; stipels mostly present, the stipules ovate to linear, often produced below the enlarged point of insertion, the lower element sometimes bifid. *Inflorescences* elongate stout racemes, sometimes branched, the flowers somewhat clustered at the end of the rachis; bracts often caducous, bracteoles ovate; pedicels inserted 1–7 at a node. *Flowers* sometimes appearing before the leaves; calyx campanulate, 5-toothed, the upper pair free or fused into a lip; corolla mostly bluish, pinkish or violet; standard broad, entire or emarginate, minutely spurred, the wings spurred; stamens 10, the vexillary stamen free or united to the others, usually at the middle of the filament, the anthers all alike; ovary pubescent, the style curved or abruptly bent, glabrous, the stigma glabrous. *Legume* oblong, compressed, usually pilose.

This genus of about 20 species is native to southern and eastern Asia. Two species are adventive or naturalized in the New World.

Literature:

Verdcourt, B. 1968. The identities of *Dolichos trilobus* L. and *Dolichos trilobatus* L. Taxon 17: 170–173.

1. **Pueraria lobata** (Willd.) Ohwi,[80] Bull. Tokyo Sci. Mus. 18: 16. 1947, not seen.—FIG. 42.

Dolichos lobatus Willd., Sp. Pl. 3: 1047. 1803. TYPE: *Dolichos trilobus* Houttuyn, Nat. Hist. ed. Panzer. 8: 560. *tab. 64, fig. 1.* 1782, fide Verdcourt 1968.
Pachyrhizus thunbergianus Sieb. & Zucc., Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 237. 1846.
Pueraria thunbergiana (Sieb. & Zucc.) Benth., J. Linn. Soc. Bot. 9: 122. 1865.

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[79] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.
[80] For other synonyms see Verdcourt, 1968. Only these names relate to Panamanian plants.

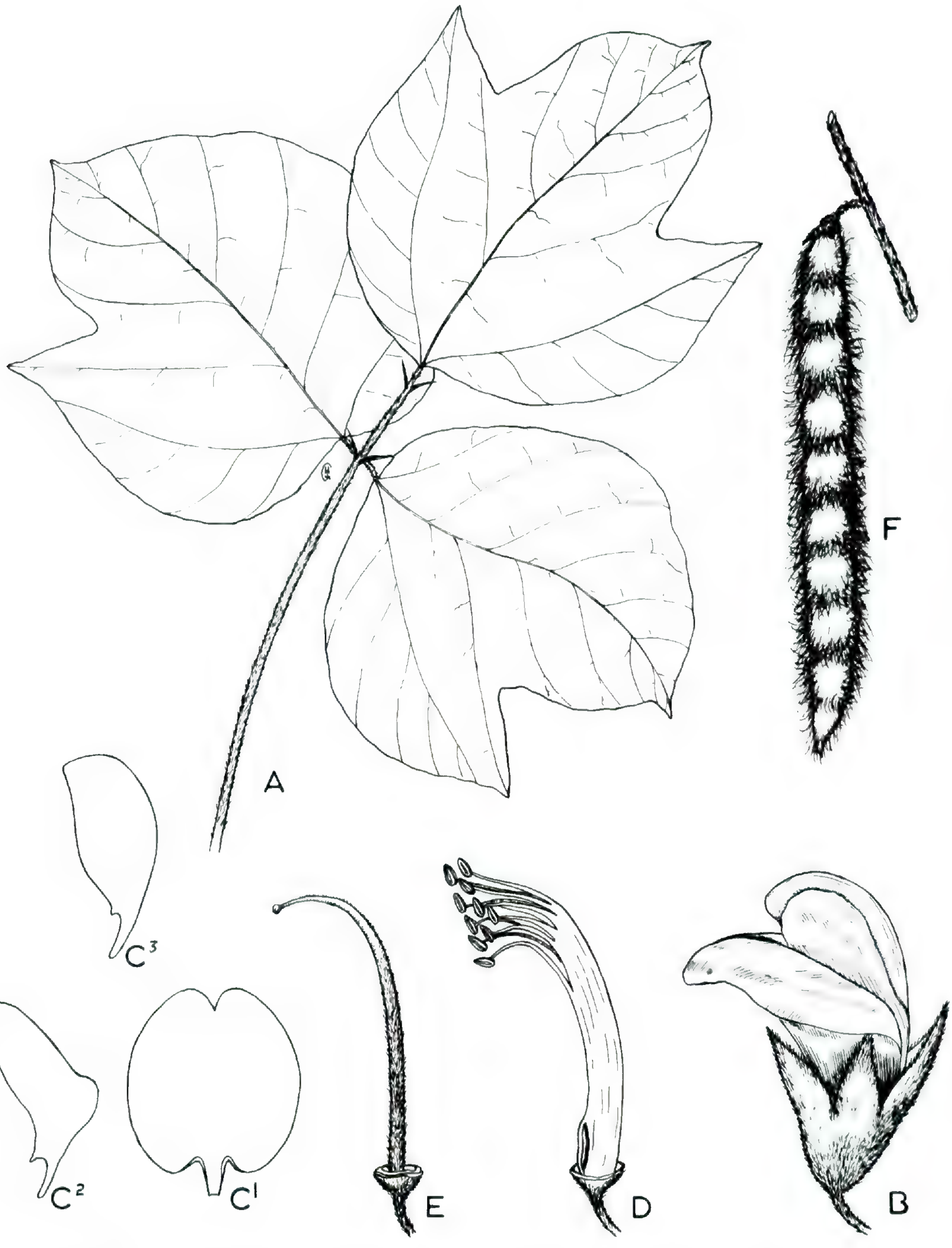

FIGURE 42. *Pueraria lobata* (Willd.) Ohwi.—A. Habit (×½). [After *Wedel 2482.*]—B. Flower (×1½).—C. Corolla.—C^1. Standard (×1).—C^2. Wing petal (×1).—C^3. Keel petal (×1).—D. Stamens (×1½).—E. Pistil (×1½). [After *Wedel 2605.*]—F. Fruit (×1). [After *Henry 953.*]

Robust *vines* clambering on the ground and on shrubs, occasionally high climbing; stems terete, branching, puberulent with appressed short hairs. *Leaves* pinnate trifoliolate, the leaflets often large and somewhat felty, broadly ovate, often 3-lobate, apically short acuminate, the sinuses rounded to obtuse, mucron-

ulate, basally rounded, truncate or subcordate, 3 nerved from the base and pinnate veined above, discolorous, appressed pubescent on both sides, often with coarse hairs, often ca. 15 cm long and 15 cm wide, the lateral leaflets strongly oblique; petiolules 4–7 mm long, often stout, tomentose; rachis 2–5 cm long; petioles shorter than the terminal leaflet; stipels linear, pubescent, 4–7 mm long; stipules oblong or ovate, puberulent, 4–8 mm long and produced 3–5 mm below the point of insertion, the insertion point ovate. *Inflorescences* often few, to 30 cm long, the peduncle stout, pubescent, sometimes with 1 or 2 empty stipule-like bracts along its length; rachis slightly thinner, often more than twice as long as the peduncle; pedicels 3–6 mm long, pubescent, inserted mostly in 3's at the nodes; bracts ovate and stipule-like, caducous; bracteoles ovate, ciliate and pubescent, 3–5 mm long. *Flowers* pink or violet, ca. 2 cm long, the calyx campanulate, puberulent outside, the cup ca. 5 mm long, the lobes obtuse, unequal, the upper pair mostly or completely fused into a lip, the lowest tooth narrow and usually longest; corolla with the standard broad, emarginate, glabrous, slightly shorter than the wings and the keel, with 2 minute basal auricles, the wings oblong, medially coherent; stamens 10, the vexillary stamen free at the base, perhaps fused to the filament column part way up, the anthers all alike; ovary pubescent, the style and the stigma glabrous, the style bent abruptly upwards. *Legume* oblong, 4–6 cm long, 4–7 mm wide, long beaked, flat and compressed slightly between the seeds, drying dark, copiously pilose with long, 2–3 mm, yellowish hairs.

This species is native to southern and eastern Asia. It has been widely used in other warm parts of the world for forage and erosion control, and it is naturalized in many places. In Panama it is very abundant but has been collected only from islands in the Chiriqui Lagoon area of Bocas del Toro and from a few other lowland localities. *Pueraria lobata* is an aggressive vine which can quickly cover all vegetation and soil over several hectares. In spite of its vigorous vegetative growth it is sometimes seldom flowering and fruits are not always formed. It is known by the Japanese name "Kudzu."

BOCAS DEL TORO: Isla Colón, *Wedel 136* (MO). Without other locality, *Wedel 374* (MO), *511* (GH, MO), *2482* (MO). Colombus Island, *Wedel 2605* (GH, MO), Isla Colón, *Wedel 2803* (GH, MO, NY).

38. RHYNCHOSIA

Muriel E. Poston[81]

Rhynchosia Loureiro,[82] Fl. Cochinch. 425, 460. 1790. nom. conserv. TYPE: *R. volubilis* Lour.

Leycephyllum Piper, J. Wash. Acad. Sci. 14: 363. 1924. TYPE: *L. micranthum* Piper.

Herbs or subshrubs, twining or trailing, erect to ascending; stems terete to angular and striate. *Leaves* trifoliolate, ovate to rhomboid, gland dotted above

[81] Department of Biology, Howard University, Washington, D.C. 20059.

[82] For a list of synonyms see Grear, 1978. Only these names have been used for Panamanian plants.

and beneath; stipules caducous, striate, free; stipels reduced when present; petioles 1.2–8.0 cm long, villous; petiolules 0.4–3.0 cm long, terminal petiolules longer than the laterals. *Inflorescence* racemose, axillary; bracts caducous or persistent, small, striate. *Flowers* with the calyx campanulate, the upper teeth at least partly connate; corolla papilionaceous, usually yellow with maroon markings, the standard obovate, auriculate with a short claw, the wings oblong, not auriculate, the claw narrow, the keel falcate, wider than the wings, the claw attenuate; stamens diadelphous, the vexillary stamen free, the anthers monomorphic; the style slender, the stigma entire, capitate, the ovary sessile, biovulate. *Fruits* ovate to oblong, 2-valved, pubescent, gland-dotted; seeds 2 ovate, black often with some red, hilum lateral, ovoid to elongate.

Rhynchosia is a genus of several hundred species found in both the Old World and New World tropics. The genus has its greatest diversity in Africa.

Literature:

Grear, J. W. 1979. A revision of the New World species of *Rhynchosia* (Leguminosae-Faboideae). Mem. New York Bot. Gard. 31(1): 1–168.

a. Calyx lobes 2–3 times longer than calyx tube; seeds never red.
  b. Stipules lanceolate to ovate, 0.3–1.0 cm long, 0.1–0.5 cm wide, terminal petiolules 2.0–11.0 mm long ..... 7. *R. reticulata*
  bb. Stipules linear to lanceolate, 1.5–3.0 mm long, ca. 0.5 mm wide; terminal petiolules 1.5–2.0 cm long ..... 1. *R. calycosa*
aa. Calyx lobes equal to or not more than 2 times longer than calyx tube; seeds red and black.
  c. Seeds mostly less than 4 mm long ..... 4. *R. minima*
  cc. Seeds mostly more than 4 mm long.
    d. Plants viscid; stipules persistent; hilum linear ..... 2. *R. edulis*
    dd. Plants not viscid; stipules caducous; hilum ovate.
      e. Stipels absent; pods deeply constricted between seeds, glabrous to densely puberulous, shiny black with age ..... 3. *R. erythinoides*
      ee. Stipels present; pods not deeply constricted, densely puberulous, green or brown, never shiny black.
        f. Bracts lanceolate to ovate, 2.0–5.0 mm long; pedicels ca. 5.0 mm long ..... 6. *R. quercetorum*
        ff. Bracts lanceolate, 1.5–3.0 mm long; pedicels 1.0–2.0 mm long ..... 5. *R. precatoria*

1. **Rhynchosia calycosa** Hemsley, Diagn. Pl. Mex. 48. 1880. TYPE: Panama, *Fendler 72* (MO, isotype).

Dolicholus calycosus (Hemsley) Standley, Contr. U.S. Natl. Herb. 18: 108. 1916.

Herbaceous to suffruticose *vine*; stems weakly angled to terete, strigose to puberulous. *Leaves* trifoliolate; leaflets ovate to deltoid or ovate rhomboid, 2.5–7.0(–9.0) cm long, 1.5–5.5 cm wide, apically acute, basally cuneate to obtuse, strigose above, villous and gland dotted beneath; terminal petiolule 1.5–2.0 cm long, the lateral petiolules 0.2–0.3 cm long; petiole 2.5–4.2 cm long, villous; stipels subulate, 1.0–2.0 mm long, the stipules linear to lanceolate, 1.5–3.0 mm long, caducous. *Inflorescence* exceeding the leaves, 7.0–20.0 cm long; peduncles 1.0–6.5 cm long; pedicels 1.0–2.0 mm long; bracts lanceolate, 3.0–4.0 cm long, ca-

ducous. *Flowers* with the calyx equalling or exceeding the corolla, 7.0–11.0 mm long, the lobes 7.0–9.0 mm long, ca. 2.0 mm wide, upper lobes united halfway up; corolla yellow, 6.0–10.0 mm long, the standard obovate, auriculate, 7.0–10.0 mm long, 3.0–5.0 mm wide, the claw ca. 1.0 mm long, the wing oblong, 6.0–8.0 mm long, ca. 2.0 mm wide, the claw ca. 2.0 mm long, the keel falcate, 6.5–7.5 mm long, 1.5–2.0 mm wide, the claw ca. 1.5 mm long; stamens ca. 7.0 mm long, vexillary stamen free. *Fruits* ovate to oblong, 1.5–2.5 cm long, 0.5–0.8 cm wide, puberulous to strigose, gland dotted, the beak ca. 2.0 mm long; seeds 2, suborbiculate, ca. 3.5 mm long, 3.0 mm wide, black brown mottled, hilum ovate, 1.0–1.5 mm long.

This species ranges from Central America to Ecuador. In Panama it is found in secondary growth and dry forested areas.

CANAL ZONE: Road C-21 near Police Lodge, *Croat 12993* (MO, SCZ). Quebrada La Palma and Cañon of Río Chagres, *Dodge & Allen 17342* (GH, MO). Las Cruces Trail, *Hunter & Allen 761* (GH, MO). CHIRIQUÍ: Baja Gualaca, *Koster 172* (MO). COCLÉ: Río Hato airstrip, *Blum & Dwyer 2479* (MO). Río Grande, *Burch et al. 1168* (GH, MO). DARIÉN: Agua Fria 8 mi N of Santa Fé, *Duke 10105* (MO, US). Camp Lagarto, *Duke 15192* (MO). Camp Hydro on Río Mortí, *Duke 15416* (MO). LOS SANTOS: 3 mi S of Carreta, 5 mi S of Las Tablas, *Burch et al. 1243* (GH, MO, US). Las Tablas, *Koster 121* (MO). PANAMÁ: Hills between Capira and Potrero, *Dodge & Hunter 8605* (GH, MO). San Jose Island, *Johnston 1106* (GH, MO). VERAGUAS: El Embalsadero, 8 mi W of Santiago, *Tyson 6080* (FSU, MO, SCZ).

2. **Rhynchosia edulis** Griseb., Abh. Königl. Ges. Wiss. Göttingen 19: 123. 1874. TYPE: Paraguay, *Balansa 1553* (not seen; photo, US).

Dolicholus ixodes Standley, Contr. U.S. Natl. Herb. 18: 107. 1916. TYPE: Panama, *Williams 119* (holotype, US).
Rhynchosia ixodes (Standley) Standley, Field Mus. Nat. Hist., Bot. Ser. 4: 214. 1929.

Vine, herbaceous to suffrutescent, stems angular to terete, pubescent. *Leaves* trifoliolate, ovate to ovate rhomboid, 1.0–3.5 cm long, 1.0–2.3 cm wide, apically acute, basally obtuse, strigulose above, hirsutulose, gland dotted beneath, viscid on both surfaces; terminal petiolule ca. 1.0 cm long, the lateral petiolules obsolete or to 1.0 mm long; petiole ca. 1.3 cm long, viscid; stipels caducous; stipules lanceolate ca. 0.5 cm long. *Inflorescence* equal to or exceeding the leaves, ca. 2.0 cm long; peduncle ca. 1.0 cm long; bracts lanceolate 2.0–3.0 mm long, caducous; pedicels ca. 0.4 cm long. *Flowers* with the calyx not exceeding the corolla, viscid, puberulent, ca. 0.4 cm long, the lobes 2.0–3.0 mm long, the upper lobes partially united; corolla purplish, to 6.5 mm long, the standard obovate, auriculate, gland dotted, ca. 5.0 mm long, ca. 3.5 mm wide, the claw ca. 1.0 mm long, the wings oblong, ca. 4.5 mm long, ca. 1.5 mm wide, the claw ca. 1.5 mm long, the keel falcate, ca. 4.5 mm long, ca. 2.0 mm wide, the claw ca. 2.0 mm long; stamens 4.5 mm long. *Fruits* oblong ovate, strigose, gland dotted, viscid, ca. 1.5 cm long, 0.6 cm wide, the beak ca. 3.0 mm long; seeds ovoid, ca. 4.0 mm long, hilum linear, 1.0–2.0 mm long.

This species is known from southeastern Arizona through to South America. In Panama it is found in roadside savannas.

PANAMÁ: Between Río Pacora and Chepo; *Porter et al. 5136* (MO).

3. **Rhynchosia erythinoides** Schlecht. & Cham., Linnaea 5: 587. 1830. TYPE: Mexico, inter Misantlem et Nantlam in sylvis. *Schiede & Deppe* not seen.—FIG. 43.

Leycephyllum micranthum Piper, J. Wash. Acad. Sci. 14: 363. 1924. TYPE: Costa Rica: Las Vueltes, Turrique, *Tonduz 12951* (isotype, US).

Suffrutescent to woody *vine*, the stems angled, becoming terete, strigulose to puberulose. *Leaves* trifoliate, the leaflets ovate, ovate rhombic to lanceolate, 3.0–10.0 cm long, 2.5–8.0 cm wide, apically acute to acuminate, basally rounded to cuneate, sparsely villous, gland dotted below, glabrous to sparsely villosulose above; petiolule of terminal leaflet 1.5–3.0 cm long, petiolule of lateral leaflet 0.2–0.4 cm long; petiole 2.5–8.0 cm long, villosulose; stipels absent; stipules lanceolate, 2.0–3.0 mm long, 0.5–1.0 mm wide, caducous. *Inflorescence* branching, equal to or exceeding the leaves, 5.0–13.5 cm long; peduncles 0.6–1.0 cm long; pedicel 1.0–2.0 mm long; bracts lanceolate, 1.5–3.0 mm long, 0.5–2.0 mm wide, caducous. *Flowers* with the calyx not exceeding the corolla, 3.0–4.0 mm long, the lobes of the calyx lanceolate, 1.0–2.0 mm long, villosulose, gland dotted; corolla yellow with maroon striations, 5.0–7.0 mm long, the standard obovate, auriculate, 5.0–7.0 mm long, 4.5–6.0 mm wide, the claw ca. 1.0 mm long, the wings oblong, 5.0–7.0 mm long, 1.5–2.5 mm wide, the claw ca. 1.0 mm long, villosulose, the keel falcate, 5.5–7.5 mm long, 2.0–3.0 mm wide, the claw 1.5–2.0 mm long; stamens 5.0–7.0 mm long, vexillary stamen free. *Fruits* ovate, deeply constricted in the middle, 1.5–2.0 cm long, 0.5–1.0 cm wide, brown to black, hirsutulose, gland dotted, the beak ca. 1.0 mm long; seeds 2, ovoid, ca. 4.0 mm long, ca. 3.0 mm wide, black with a red band around, the hilum ovate, ca. 3.0 mm long.

This species ranges from eastern Mexico to Ecuador, occurring in thickets and in clearings and secondary growth.

BOCAS DEL TORO: Old Bank Island, Chiriqui Lagoon, *Wedel 1982* (GH, MO, NY, US), *2084* (GH, MO). CANAL ZONE: BARRO COLORADO ISLAND: *Busey & Croat 242* (MO); *Croat* 28 August 1971, *10201*, *10331*, *10928*, *11899* (all MO), *13817* (F, MO, NY); *Foster 2173* (F, US); *Shattuck 139* (F, MO), *750* (MO, US), *812* (F, MO); *Wilson 1217* (F, MO); *Woodworth & Vestal 414* (F, MO), *596* (A, F, MO). Chagres, *Fendler 66* (F, MO, US). Near Gatún, *Hayes 911* (NY). W of Limon Bay, Gatún Locks and Gatún Lake, *Johnston 17211* (A, MO). Hills around Agua Clara Reservoir near Gatún, *Pittier 2651* (GH, NY, US). CHIRIQUÍ: W of San Bartolo Limite near Costa Rican border, *Croat 22157B* (MO). Roadside to Cañas Gordas, 18 km from Paso Canoas, near Quebrada de Vuelta, *Croat 22215* (MO). COLÓN: Santa Rita Ridge, 5 mi from highway, *Croat 13188* (MO, NY). María Chiquita, *Dwyer 2992* (MO, US). Santa Rita East Ridge, *Dwyer 8411* (MO). PANAMÁ: Beyond Cerro Jefe, *Duke & Dwyer 15069* (MO). Bismark above Penonomé, *Williams 564* (NY, US).

4. **Rhynchosia minima** (L.) DC., Prodr. 2: 385. 1825.

Dolichos minimus L., Sp. Pl. 726. 1752. LECTOTYPE: Jamaica, St. Jago de La Vega. *Sloane*, not seen (selected by Verdcourt, 1971).

Herbaceous to suffrutescent *vine*; stems angular, puberulent to villosulose. *Leaves* trifoliolate, the leaflets ovate to ovate rhomboid to orbicular, 2.0–3.8 cm long, 1.0–3.0 cm wide, apically acute, basally cuneate to truncate, glabrous to finely strigulose above, puberulose to villosulose, gland dotted beneath; petiolule

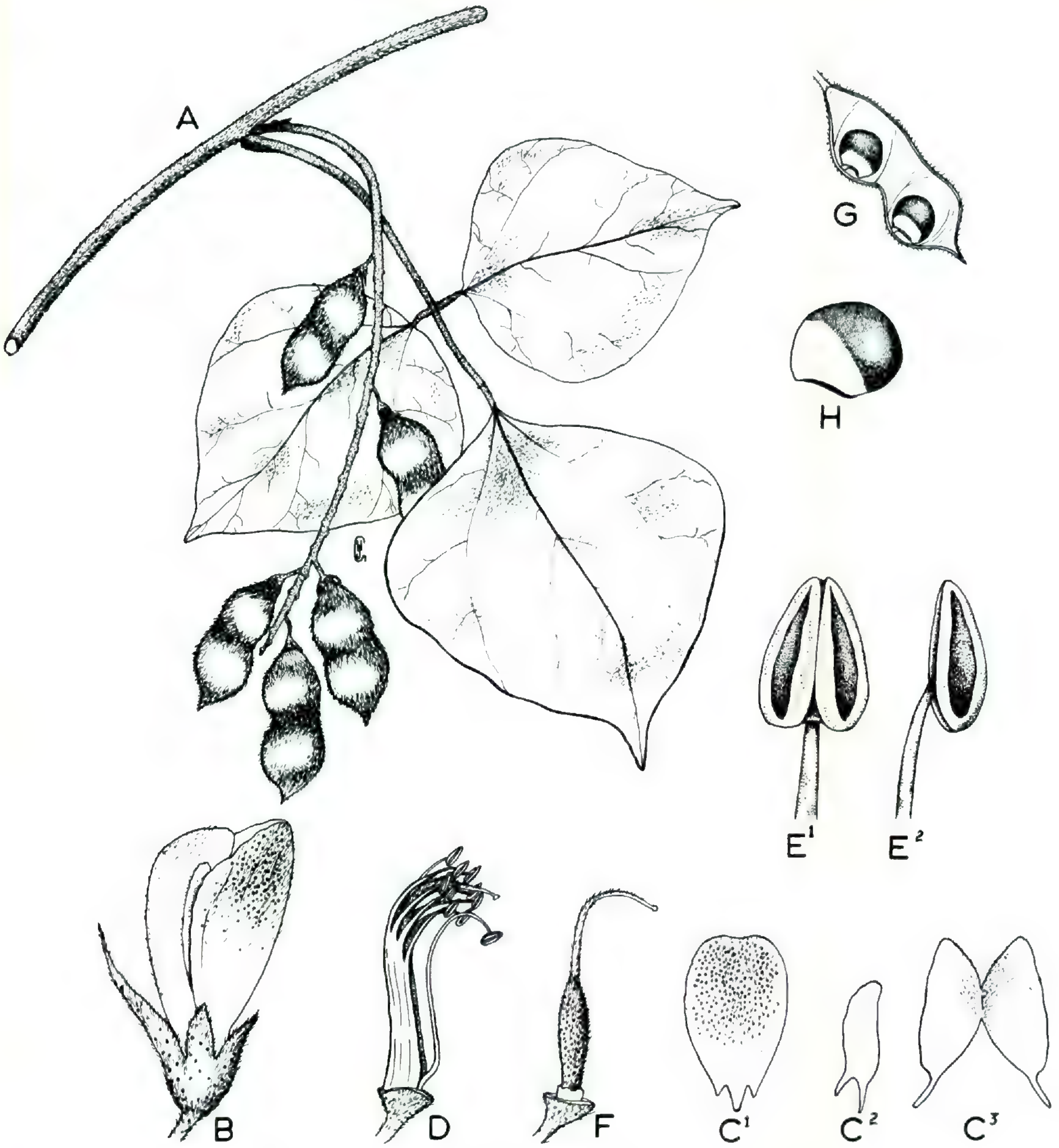

FIGURE 43. *Rhynchosia erythrinoides* Schlecht. & Cham.—A. Habit (×½). [After *Davidson 927.*]—B. Flower (×5).—C. Corolla.—C¹. Standard (×2½).—C². Wing petal (×2½).—C³. Keel petal (×2½).—D. Stamens (×5).—E. Anthers.—E¹. Abaxial view.—E². Lateral view.—F. Pistil (×5). [After *Wedel 2084.*]—G. Fruit (×¾).—H. Seed (×2). [After *Davidson 927.*]

0.3–1.0 cm long, the terminal leaflet with longer petiolule; petiole 1.2–4.0 cm long; strigose; stipels subulate, ca. 1.0 mm long; stipules linear to lanceolate, 3.0–10.0 mm long, 0.5–1.0 mm wide, persistent, villosulose. *Inflorescence* equalling or exceeding the leaves, 6.8–13.5 cm long, many flowered, the peduncle 1.2–7.0 cm long, the pedicels ca. 2.0 mm long; bracts lanceolate, ca. 1.0 mm long, caducous. *Flowers* with the calyx not exceeding the corolla, 2.0–4.0 mm long, the lobes 1.0–3.0 mm long, lanceolate, the upper lobes united part way, puberulose, gland dotted; corolla yellow with purplish striations, puberulose, gland

dotted, 5.0–7.0 mm long, 3.0–5.0 mm wide, the claw 1.0 mm long, the wings oblong, 4.0–5.0 mm long, 1.75–2.0 mm wide, the claw 1.0 mm long, the keel falcate, 5.0–6.0 mm long, 1.5–2.0 mm wide, the claw 1.0–2.0 mm long; stamens 5.0–7.0 mm long. *Fruits* oblong, ovate, strigose, gland dotted, 0.9–1.5 cm long, 0.3–0.4 cm wide, the beak 0.5–1.0 mm long; seeds ovoid, brown, black mottled ca. 3.0 mm long, ca. 2.0 mm wide, hilum ovate, 0.5–1.0 mm long, the strophiole lobes narrow.

This species is nearly cosmopolitan, occurring throughout Mexico and Central America and south into Argentina.

BOCAS DEL TORO: Careening Cay, vicinity of Chiriqui Lagoon, *von Wedel 2819* (MO, NY, US). CANAL ZONE: ½ mi NW of Gamboa, 5 Apr. 1973, *Liesner 1396* (F, MO); *Standley 28527* (US). 2½ km W of Gamboa, gravel along RR, *Nee 9502* (F, GH, MO). Balboa, *Standley 25646* (US), *Standley 32143* (US). CHIRIQUÍ: Corotu, 6 km SW of the airport of Puerto Armuelles, *Busey 398* (F, GH, MO, US). 1.6 m W of Puerto Armuelles, ca. 50 m, *Croat 21934* (F, GH, MO, NY). Distrito Guanabano; Quebrada Quanabano, 0–100 m, *Croat 22512* (F, MO). Quebrada Mellize, 6 km S of Puerto Armuelles; 0–150 m, *Liesner 419* (MO, NY). PANAMÁ: Campo Experimental de Monte Oscuro, 12 km de Capira, *Correa 1929* (MO). Riomar, *Dwyer 1844* (MO). El Capitano, 3 mi E of Chepo, *Tyson 5357* (MO). Tocumen, *Dwyer 2583* (FSU, GH, NY). Forestry Reserve, *Flores 28* (F). LOS SANTOS: Chitré/Las Tablas, 0–100 m, *Burt & Rattray 53* (MO). 5 mi S of Pocri, *Croat 9732* (MO, SCZ). 6 mi S of Las Tablas, *D'Arcy 4184* (MO). 12 mi S of Macaracas, *Tyson et al.* (MO, SCZ). VERAGUAS: Atalay/Santiago, *Koster 116* (MO).

5. **Rhynchosia precatoria** (H. & B. ex Willd.) DC., Prodr. 2: 385. 1825.

Glycine precatoria H.B.K., Nov. Gen. Sp. Pl. 6: 425–426. 1823. TYPE: Mexico: prope Acapulca, not seen.

G. precatoria H. & B. ex Willd., Enum. Pl. Hort. Berol. 2: 755. 1809. TYPE: not seen.

Indigofera volubilis Wendl., Bot. Beob. 55. 1798. TYPE: not seen.

Herbaceous to suffrutescent *vine*, the stems angular becoming terete, villous to strigose, gland dotted. *Leaves* trifoliolate, the leaflets obovoid to deltoid, 3.5–8.5 cm long, 2.5–7.5 cm wide, apically acute, basally obtuse to cuneate, sparsely villosulose above, gland dotted, villosulose beneath; terminal petiolule 1.2–2.3 cm long, lateral petiolule 0.2–0.3 cm long; petiole 2.5–7.2 cm long, villous; stipels obsolete; stipules lanceolate, ca. 3.0 mm long, caducous, villous. *Inflorescence* equal to or exceeding the leaves, 6.5–10.5 cm long; peduncles 1.0–2.0 cm long; pedicels 1.0–2.0 cm long; bracts lanceolate, caducous, 1.5–3.0 mm long. *Flowers* with the calyx not exceeding the corolla, 3.0–5.5 mm long, the lobes 1.0–2.5 mm long, the upper lobes longer than the others, puberulent; corolla yellowish green streaked with brown, 0.6–0.8 cm long, the standard orbicular, auriculate, gland dotted, ca. 0.8 cm long, ca. 0.4 cm wide, the claw ca. 1.5 mm long, the wings oblong, ca. 0.7 cm long, ca. 0.2 cm wide, the claw ca. 1.5 mm long, the keel falcate, ca. 0.7 cm long, ca. 0.1 cm wide, the claw ca. 0.2 cm long; stamens ca. 0.7 cm long. *Fruits* ovate oblong, strigose, 1.5–2.0 cm long, 0.6–0.8 cm wide, the beak 2.0–3.0 mm long; seeds ovoid, ca. 5.0 mm long, ca. 3.0 mm wide, red and black, the hilum linear to ovate, 2.5 mm long, the strophiole lobes narrow.

This species ranges from Mexico to Colombia. It is found in young secondary growth in thickets.

PANAMÁ: Pacora, *Burt & Rattray 21* (MO). San Jose Island, *Erlanson 382* (GH, NY, US); *Johnston 588, 1132* (both GH), *1331* (GH, US).

6. **Rhynchosia quercetorum** Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 555. 1937. TYPE: Costa Rica: "Oak forests, Santa María de Dota" *Standley & Valerio 43431* not seen.

Rhynchosia picta Seem., Bot. Voy, Herald 110. *tab. 20.* 1850; Steud., Nom. 1840. TYPE: Panama: "Volcano of Chiriqui, Veraguas" *Seemann 1678* not seen.

Herbaceous to suffruticose *vine,* stems angular becoming terete with age, strigose. *Leaves* trifoliolate, the leaflets ovate to rhomboid, 4.0–10.0 cm long, 4.0–9.0 cm wide, apically acuminate to acute, basally cuneate to obtuse, glabrous to villosulose above, gland dotted and tomentose to villosulose beneath; terminal petiolule 1.5–3.0 cm long, the lateral petiolule 0.2–0.3 cm long; petiole 3.0–8.0 cm long, strigose; stipules lanceolate 0.4–0.6 cm long, caducous; stipels ca. 1.0 mm long, caducous. *Inflorescence* equal to or exceeding the leaves, branching, ca. 8.5 cm long; peduncles 1.5–3.5 cm long; pedicels ca. 5.0 mm long; bracts lanceolate to ovate, 2.0–5.0 mm long, caducous. *Flowers* with the calyx not exceeding the corolla, 3.0–4.0 mm long, the lobes 2.0–3.0 mm long, the vexillary lobes united ca. ½ to apex, the calyx strigose to villous; corolla yellow streaked with maroon, the standard obovate, puberulose, gland dotted, auriculate, 7.0–10.0 mm long, 4.5–8.5 mm wide, the claw ca. 1.0 mm long, the wings oblong, 6.0–10.0 mm long, 2.0–4.0 mm wide, the claw ca. 1.5 mm long, the keel falcate, 7.0–10.0 mm long, ca. 3.0 mm long, the claw ca. 2.0 mm long; stamens 7.0–9.0 mm long. *Fruits* oblong ovate, heavily strigose, viscid, gland dotted, greenish brown but not black, 2.8–4.0 cm long, 0.8–1.0 cm wide, the beak 3.0–4.0 mm long; seeds ovoid to subglobose, red and black with equal areas of coloration, 4.0–5.0 mm long, 3.0–4.0 mm wide, the hilum ovate, ca. 2.0 mm long, strophiole lobes narrow.

This species is distributed throughout Central America to Colombia. Plants of *R. quercetorum* occur in open forested areas in Panama and have been collected only in Chiriquí above 1,500 m.

CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, *Allen 1482* (MO, NY, US). Cerro Punta, *Allen 3499* (MO). Finca Lerida, S slopes of Quebrado Velo, *Allen 4738* (MO). Boquete, Finca Collins, *Blum & Dwyer 2547A* (FSU, SCZ); *Davidson 555* (A, F, MO, US), *927* (F, MO, US), *1067* (F, GH, US). S slopes of Volcán Chiriquí, *Terry 1302* (F, GH, MO). Boquete, *von Hagen 2124* (MO, NY). Finca Lerida to Piña Blanca, *Woodson & Schery 307* (MO, US). Callejon Seco, Volcán Chiriquí, *Woodson & Schery 495* (GH, MO, US).

7. **Rhynchosia reticulata** (Swartz) DC., Prodr. 2: 385. 1825.

Glycine reticulata Swartz, Prodr. 105. 1788. TYPE: Jamaica, Swartz, not seen.
Dolicholus kuntzei Kuntze, Rev. Gen. Pl. 3(2): 61. 1898. TYPE: not seen.
Dolicholus hondurensis Rose, Contr. U.S. Natl. Herb. 10: 101. 1906. TYPE: Honduras, "Dept. Santa Bárbara near San Pedro Sula," not seen.
Rhynchosia hondurensis (Rose) J. D. Smith, Enum. Pl. Guat. Index 8: 172. 1907.
Dolicholus angulatus Standley, Contr. U.S. Natl. Herb. 18: 107. 1916. TYPE: Panama, "between Miraflores and Pedro Miguel, Canal Zone," not seen.

Herbaceous to suffruticose *vine;* stems angled to terete, villous to strigose along ridges. *Leaves* trifoliolate, leaflets ovate to obovate, the lateral leaflets asymmetric, 2.5–6.5 cm long, 2.3–5.5 cm wide, apically acute, basally cuneate to subcordate, finely strigulose above, reticulate, strigulose and gland dotted be-

neath; terminal petiolule 2.0–11.0 mm long, the lateral petiolules 1.0–2.0 mm long; petiole 2.0–4.5 cm long, angled, villous; stipels linear, 1.0–2.0 mm long; stipules lanceolate to ovate 0.3–1.0 cm long, 0.1–0.5 cm wide, caducous to persistent. *Inflorescence* shorter or longer than the leaves, 5.0–13.5 cm long, densely, ca. 20–30, flowered; peduncles 1.5–2.5 cm long, pedicels ca. 3.5 mm long; bracts lanceolate, 3.0–5.0 mm long, caducous. *Flowers* with the calyx usually equal to or exceeding the corolla, 0.7–1.1 cm long, the lobes lanceolate, 0.5–0.9 cm long, puberulent, gland dotted; corolla yellow, 0.6–1.0 cm long, puberulent, gland dotted, the standard obovate, auriculate, 8.0–9.5 mm long, 3.0–4.0 mm wide, the claw ca. 1.0 mm long, the wing oblong, 7.5–8.0 mm long, ca. 2.0 mm wide, the claw ca. 1.0 mm long, the keel falcate, 7.5–9.0 mm long, ca. 2.0 mm wide, the claw 1.0–1.5 mm long; stamens 5.0–9.0 mm long. *Fruits* oblong ovate, 1.5–2.0 cm long, 0.5–0.7 cm wide, the beak 1.0–2.0 mm long, puberulent; seeds 2, ovoid, ca. 3.0 mm long, brown black, hilum ovate, ca. 1.0 mm long.

This species ranges from Mexico to South America including the Greater Antilles. It occurs in disturbed areas, moist forests, thickets, and savannas below 1,200 m. Grear (1978) delimited two varieties of *R. reticulata* but in Panama these varieties do not appear to be distinguishable on the basis of geography and morphology.

CANAL ZONE: Pipeline road 2½ mi from Gamboa gate, *Croat 9385* (MO, SCZ). Gaillard highway 1 mi NW of Summit Garden, *Croat 13919* (F, MO, SCZ). Pipeline road 4 mi from main gate, *Croat 14100* (MO, SCZ). Without other locality, *Greenman & Greenman 5135* (MO). Near Summit Garden, *Hladick* (MO). Balboa, *Standley 26086* (MO, US). 1 mi N of Summit on road to Gamboa, *Tyson 2765* (MO). CHIRIQUÍ: Near Veladero, *Burt & Koster 127* (MO). Francis Arriba School, ca. 14 mi N of David, *Lewis et al. 681* (GH, MO). COCLÉ: Entrance to Río Hato Air Base, *Blum & Tyson 1867* (FSU, MO, SCZ). HERRERA: El Portero, Las Minas, *Burt & Koster 90* (MO). Highway N of Las Minas, *Croat 9668* (MO, NY). 10 mi S of Ocú, *Tyson et al. 2804* (FSU, MO, SCZ). PANAMÁ: La Chorrera, Bejuco, *Burt & Rattray 25* (MO, NY). Between Chepo and El Llano, *Croat 14487* (MO, NY). Río Tocumen N of Chepo road, *Hunter & Allen 239* (GH, MO). Between Río Pacora and Chepo, *Porter et al. 4205* (MO, SCZ). VERAGUAS: Between Cañazas and the foot of the Cordillera Central, Headwaters of Río Cañazas, *Allen 191* (A, MO, US). La Pena, *Burt & Rattray 83* (MO). Without locality: *Hayes 720* (NY).

39. SESBANIA

Peter S. White[83]

Sesbania Scopoli,[84] Introd. 308. 1777. Nomen conserv. contra *Sesban* Adanson, *Agati* Adanson. LECTOTYPE: *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill (designated by Jones, 1960).

Sesban Adans., Fam. Pl. 2: 327, 604. 1763. Nomen rejic. contra *Sesbania*. Based on *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill.

Agati Adanson, Fam. Pl. 2: 326, 513. 1763. Nomen rejic. contra *Sesbania*. Based on *Robinia grandiflora* L. = *Sesbania grandiflora* (L.) Pers.

Sesbana R. Brown in Ait., Hort. Kew., (ed. 2) 4: 330. 1812. *Sesbania* Scop., orth. mut.

Daubentonia DC., Comm. Mem. Legum. 285. 1823. TYPE: *Piscidia punicea* Cav. = *Sesbania punicea* (Cav.) Benth.

Resupinaria Raf., Sylva Tell. 115. 1838. TYPE: *Robinia grandiflora* L. = *Sesbania grandiflora* (L.) Pers.

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[84] For additional generic synonymy see Hutchinson, 1967.

Emerus Kuntze, Rev. Gen. Pl. 1: 180. 1891. TYPE: *Aeschynomene sesban* L. = *Sesbania sesban* (L.) Merrill. Non *Emerus* Mill. (1754) nor *Emerus* Guettard (1753).

Daubentoniopsis Rydb., Amer. J. Bot. 10: 497. 1923. TYPE: *Aeschynomene longifolia* Cav. = *Sesbania longifolia* (Cav.) DC.

Annual or perennial *herbs, shrubs,* or small *trees. Leaves* alternate, even pinnate, often relatively narrow in outline and with numerous leaflets; leaflets oblong, entire, obtuse at the apex, rounded at the base, often glaucous, short petioluled; stipules small, deciduous; stipels minute or apparently absent. *Inflorescence* of relatively short and few-flowered axillary racemes; bracts and bracteoles small, apparently deciduous. *Flowers* with the hypanthium broadly campanulate, as broad as long or broader, the 5 teeth equal, often short, truncate to triangular with the tip acute to acuminate; often thin; petals white, yellow, purplish, red, sometimes white spotted with color or variegated; standard longer than other petals, nearly round in outline, reflexed, short clawed and usually appendaged at the base, the wing petals free, the keel petals curved, joined below, with long claws; stamens diadelphous, the vexillary stamen free, geniculate near the base, the united stamens equal or 5 alternate ones somewhat longer; ovary stipitate, linear, the stigma small, capitate. *Fruit* often long and slender, terete (in extra-Panamanian species sometimes compressed, 4-angled or 4-winged), short stipitate, beaked, septate between the seeds within, the outside indented between the seeds in some species, 2-valved, indehiscent in a few species, the calyx often not persistent in fruit; seeds many oblong, slightly compressed, smooth, brown.

Sesbania is a genus of some 50 species of the tropical and warm parts of both the New and Old World. Among its relatives in Panama it is distinguished by the relatively long and narrow even pinnate leaves. Three species are known from Panama, one of which, *Sesbania grandiflora* (L.) Pers., is an introduced tree. The two other species are native herbs.

Sesbania sesban (L.) Merrill, a weedy plant native to the Old World tropics, has become established in parts of the West Indies and South America. It has not yet been collected in Panama, but is to be looked for there. In general it resembles *Sesbania emerus* and *S. exasperata,* which are treated below, but can be distinguished by several characters: the calyx teeth are low triangular, less than 1 mm long, and acute; calyx is less than 5 mm long; corolla is less than 1.5 cm long; racemes are 5–12 flowered; outside of the legume is indented between the seeds. In *Sesbania emerus* and *S. exasperata,* the calyx lobes are acuminate, longer than 1 mm; calyx is more than 6 mm long; corolla is more than 1.5 cm long; the racemes are usually less than 6-flowered, and the outside of the legume is not or only slightly indented between the seeds.

Sesbania sesban, the type species, has received attention in recent literature regarding tautonyms and paratautonyms (Nicolson, 1975; Terrell, 1977). Terrell (1977) argues that names such as *Lycopersicon lycopersicum* should be regarded as tautonyms since the two words that make up the binomial are orthographic variants of one another. Both the generic name and the specific epithet are inflected variants of the same stem word. He feels that such names are prone to confusion. On the other hand, he feels that such names as *Sesbania sesban* are less confusing. Here, the stem of the specific epithet is uninflected. Terrell (1977)

argues that the two words making up the binomial *Sesbania sesban* are not orthographic variants and that the binomial is not a tautonym. Terrell's argument and proposal seem entirely reasonable and with this in mind the name *Sesbania sesban* (L.) Merrill is used here.

The type of *Agati* Adanson was initially listed in the Code (1961) and in the *Index Nominum Genericorum* as *Robinia caragana* L. Later, both were corrected to *Robinia grandiflora* L., i.e., in later editions of the Code list of conserved and rejected names and in a correction card in the ING list.

Literature:

Jones, K. 1960. The lectotype species selections of Britton and Brown and the standard species of Hitchcock and Green. Taxon 9: 175–189.

Nicolson, D. H. 1975. Paratautonyms, a comment on proposal 146. Taxon 24: 389–390.

Seemann, B. 1857. The botany of the voyage of the H.M.S. Herald. London. 483 pp.

Terrell, E. E. 1977. The name for tomato. Taxon 26: 129–148.

a. Flowers large, 6–9 cm long; fruit (20–)30–50 cm long; an introduced small tree, but sometimes flowering when quite young ---------- 3. *S. grandiflora*

aa. Flowers smaller, ca. 1.5–2.5 cm long; fruit 15–25 cm long; native herbs or with shrubby appearance to several m high.

b. Legume 3–4 mm broad; seeds 3–4 mm long; corolla less than 2 cm long; pedicels in both flower and fruit relatively slender, rarely more than 1 mm wide, if so then not over 2 mm wide in fruit ---------- 1. *S. emerus*

bb. Legume 4–6 mm broad; seeds 4–5 mm long; corolla 1.8–2.5 cm long; pedicels relatively stout, over 2 mm wide in fruit ---------- 2. *S. exasperata*

1. **Sesbania emerus** (Aubl.) Urban, Feddes Repert. Spec. Nov. Regni Veg. 16: 149. 1919.—FIG. 44.

Aeschynomene emerus Aubl., Hist. Pl. Guiane 2: 775; Tabl. noms. 1. 1775. TYPE: Guiana, *Aublet*, not seen.

Coronilla occidentalis Willd., Sp. Pl., (ed. 4) 1147. 1802. TYPE: West Indies, *Humboldt* (B, not seen; microfiche MO).

Sesban occidentalis (Willd.) Poir. in Lam., Encycl. Méth. Bot. 7: 129. 1806.

Sesbania occidentalis (Willd.) Pers., Syn. Pl. 2: 316. 1807.

Sesbania macrocarpa sensu Seemann, Bot. Voy. Herald 108. 1857, non *S. macrocarpa* Muhl. ex Raf., Fl. Ludov. 137. 1817.

Emerus sesban var. *occidentalis* (Willd.) Kuntze, Rev. Gen. Pl. 1: 181. 1891.

Sesban emerus (Aubl.) Britton & Wilson, Sci. Surv. Porto Rico 5: 395. 1924.

Erect *herbs* or *shrubs* to 2 m tall, glabrous. *Leaves* long and narrow with numerous regularly spaced, short stalked leaflets; leaflets ca. 70–100, narrowly oblong, rounded at both ends, mucronate at the apex, to 25 mm long, ca. 3 mm wide; petioles 5–10 mm long; petiolules to 1 mm long; rachis to ca. 20 cm long; stipules linear to lanceolate, acuminate, to 5 mm long, apparently deciduous. *Inflorescences* axillary racemes with 3–5 flowers on thin pedicels ca. 10 mm long. *Flowers* 12–18 mm long; hypanthium broad campanulate, to 5 mm wide, ca. 5 mm long, including the calyx teeth, the teeth 1.0–1.5 mm long, triangular with abruptly acuminate tips; standard suborbicular, ca. 15 mm wide and long with raised appendages at the base of the blade, short clawed; wing petals oblong, ca.

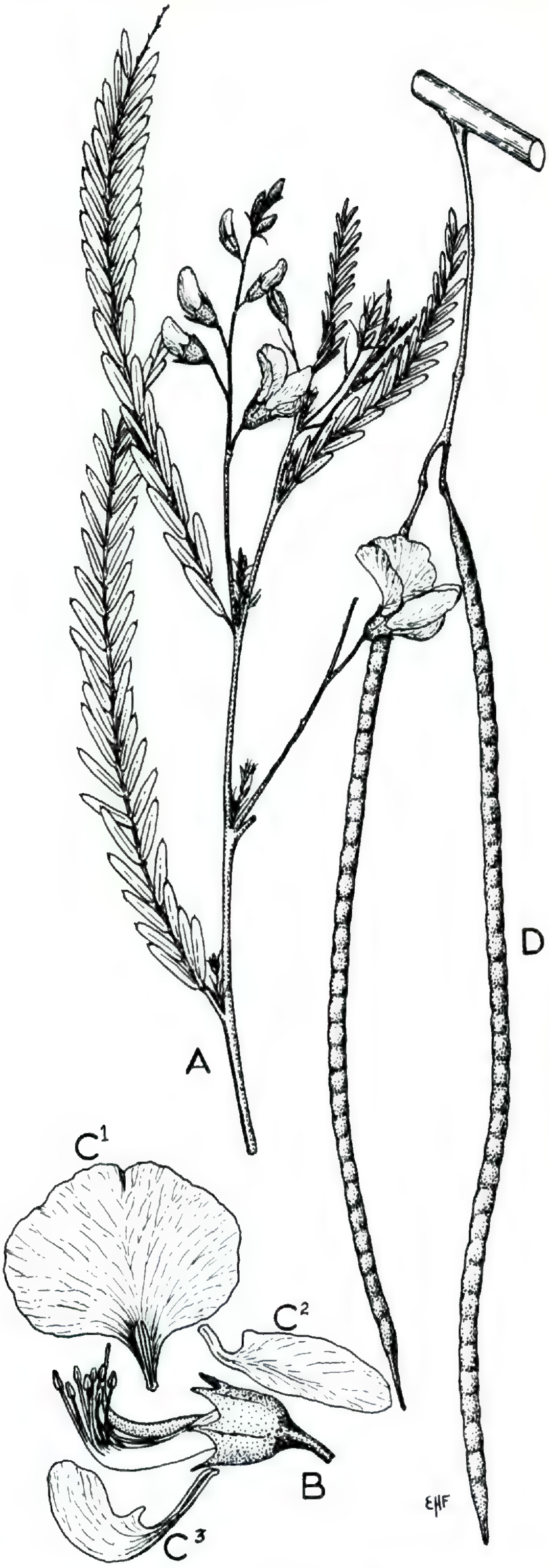

FIGURE 44. *Sesbania emerus* (Aubl.) Urban.—A. Habit (×⅔).—B. Flower, exploded (×2).—C. Corolla.—C¹. Standard.—C². Wing petal.—C³. Keel petal.

15 mm long, short clawed; keel petals slightly shorter than the other petals, upcurved; stamens with free portion of filaments alternately unequal. *Fruit* long and narrow, to 25 cm long, 3–4 mm wide, beaked, stipitate, the margins thickened, glabrous; seeds numerous, oblong, 3–4 mm long.

Sesbania emerus is found in fields and wet ground in Panama and northward throughout Central America. It is also found in the West Indies. The relation of *Sesbania emerus* to *S. exaltata* (Raf.) Cory and *S. macrocarpa* Muhl. ex Raf., both of the southern United States and to *S. exasperata* H.B.K. awaits monographic study. *Sesbania exasperata* H.B.K., in material seen by the author, has consistently broader pedicels and fruits and longer petals than *S. emerus*. Seemann's (1857) reported *S. macrocarpa* Muhl. ex Raf. from Panama proved to be *S. emerus*.

CANAL ZONE: Río Grande Station, *Hayes 772* (NY). Balboa, *Standley 25648* (US). CHIRIQUÍ: 1 mi W of Puerto Armuelles, *Croat 22037* (MO). LOS SANTOS: Managre Beach, 5 mi SE of Chitré, *Tyson et al. 3018* (MO, SCZ). PANAMÁ: S of Tocumen Airport, *D'Arcy 9662* (MO). 2 km W of El Llano, 0–100 m, *Nee 7953* (DUKE, MO, US). Between Matías Hernández and Juan Díaz, *Standley 31963* (US). Vía Tumba Muerto, *Taylor* (MO). VERAGUAS: Santiago-San Francisco Road at Río Santa María, 60 m, *Nee 8195* (MO).

2. **Sesbania exasperata** H.B.K., Nov. Gen. Sp. Pl. 6: 534. 1824. TYPE: Venezuela (P, not seen; microfiche, MO).

Lotus palustris Vell., Fl. Flum. 315. 1825; Atlas 7, *tab. 137*. 1835. TYPE: Brazil, not seen. Non Willd., Sp. Pl. (ed. 4) 1394. 1802.
Sesbania dubia Steud., Nom. Bot., (ed. 2) 2: 572. 1841. TYPE: Brazil, not seen. Non H.B.K., Nov. Gen. Sp. Pl. 6: 534, *tab. 660*. 1824.
Emerus exasperatus (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 181. 1891.
Sesban exasperatus (H.B.K.) Rydb., No. Amer. Fl. 24: 203. 1924.
Sesbania sesban sensu Johnston, Sargentia 9: 161. 1949. Non *S. sesban* (L.) Merrill.

Erect *herbs* or *shrubs*, to 3 m tall. *Leaves* 20–30 cm long, leaflets 30–50–70 or more, narrowly elliptic to narrowly oblong, rounded at both ends, mucronate apically, to 30 mm long, to 5 mm wide; petiolules to 1 mm; petioles more than 1 cm long, petiole base slightly sheathing and the stems often noticeably 3-lined from the nodes. *Inflorescence* of 2–6 flowered axillary racemes, pedicels relatively stout, over 2 mm wide. *Flowers* 1.8–2.5(–3.0) cm long when pressed, the standard not reflexed; hypanthium broad campanulate, 7–10 mm long, 6–7 mm wide when pressed, the teeth 3–4 mm long, triangular, acuminate; petals yellow, standard ovate, 3 cm long, 1.8 cm wide; wings oblong to obovate, to 2.5 cm long, the claw to 0.5 cm long; keel petals obovate, to 2.5 cm long, the claw to 0.5 cm long, upcurved; staminal sheath to 15 mm long. *Fruit* long and narrow, to 25 cm long, 4–6 mm wide, beaked, stipitate, dull, brown, the flat surface slightly indented between the seeds, the margins thickened and also slightly indented between the seeds; fruiting pedicels to 2 mm thick; seeds numerous, oblong, 4–5 mm long.

Sesbania exasperata H.B.K. is represented by a single collection from Panama, which was wrongly reported by Johnston as *Sesbania sesban*. Due to the paucity of Panamanian material, the description above was partly drawn from a

range of South American material at MO. The species is predominantly South American, although it has also been reported from the West Indies. *Sesbania exasperata* is similar to *S. emerus,* but is larger in many dimensions, i.e., in flower length, in thickness of fruits and fruiting pedicels, in the length of the hypanthium teeth and cup. The stems are more noticeably 3-lined from the nodes in *S. exasperata* than in *S. emerus*.

PANAMÁ: San Jose Island, *Johnston 1146* (GH).

3. **Sesbania grandiflora** (L.) Pers., Syn. Pl. 2: 316. 1807.

Robinia grandiflora L., Sp. Pl. 722. 1753. TYPE: India, not seen.
Aeschynomene grandiflora (L.) L., Sp. Pl., (ed. 2) 1060. 1763.
Dolichos arboreus Forssk., Fl. Aegypt.-Arab. 134. 1775. TYPE: Yemen, *Forsskål,* not seen.
Aeschynomene coccinea L. f., Suppl. Pl. 330. 1781. TYPE: "Nova Zeelandia," not seen.
Coronilla grandiflora (L.) Willd., Sp. Pl., (ed. 4) 1145. 1802. Non *C. grandiflora* Boiss. (1844).
Coronilla coccinea (L.f.) Willd., Sp. Pl. (ed. 4) 1146. 1802.
Sesban grandiflorus (L.) Poir. in Lam., Encycl. Méth. Bot. 7: 127. 1806.
S. coccineus (L.) Poir. in Lam., Encycl. Méth. Bot. 7: 127. 1806.
Sesbania coccinea (L.) Pers., Syn. Pl. 2: 316. 1807.
Agati grandiflora (L.) Desv., J. Bot. (Desvaux) 1: 120. *tab. 4.* 1813.
A. coccinea (L.) Desv., J. Bot. (Desvaux) 1: 120. 1813.
Agati grandiflora var. *coccinea* (L.) Wight & Arn., Prodr. Ind. Or. 1: 216. 1834.
Resupinaria grandiflora (L.) Raf., Sylva Tell. 116. 1838.
Emerus grandiflorus (L.) Kuntze, Rev. Gen. Pl. 180. 1891.

Small *tree* to 8 m tall, young parts hairy, soon becoming glabrous. *Leaves* alternate, even pinnate with (18–)20–40(–50) narrowly elliptic to oblong leaflets; leaflets ca. 7–10 mm wide, 25–35 mm long, rounded at the tip and base; petiole ca. 1 cm long; petiolules ca. 2 mm long, the rachis to 25 cm long; stipels minute; stipules narrowly triangular, to ca. 5 mm long, apparently deciduous. *Inflorescence* of 2–4 flowered axillary racemes, pedicels to 2 cm long, thin. *Flowers* large and showy, ca. 6–9 cm long; hypanthium ca. 10–18 mm long, not including the narrowed base, 15–18 mm wide (flattened out); teeth low to absent, the hypanthium rim variously erose; petals white, rosy white, or red; standard ca. 50–80 mm long, 40 mm wide, claw and basal auricles ca. 15 mm long; wing petals ca. 50–80 mm long, 20 mm wide, the claw ca. 20 mm long; keel petals upcurved, ca. 60 mm long with basal auricles, claw ca. ½ the length of the blade; stamens with the sheath to 80–90 mm long, 3 mm wide, strongly upcurved. *Fruits* long and narrow, to 50 cm long, ca. 0.6–0.9 cm wide, beaked, the stipe to 4 cm long; surface more or less flat or slightly indented between the seeds, smooth, dull; margins thickened and raised above the valve surface, also slightly indented between the seeds; seeds numerous.

Sesbania grandiflora (L.) Pers. is Old World in origin and is widely cultivated in the warmer parts of the world. Most of the Panamanian collections are from cultivated trees; Standley (1928) reports that it has also been found "wild." *Sesbania coccinea* (L.) Pers., considered here synonymous with *S. grandiflora,* was proposed for trees with dark red flowers.

CANAL ZONE: Cultivated, Culebra, *Pittier 2573* (US). "Planted but also wild," Balboa, *Standley 25513* (US). Cultivated, Balboa, *Standley 30824* (US). COCLÉ: Cultivated, Santa Clara, *Blum & Tyson 1883* (FSU, MO, SCZ). PANAMÁ: Universidad de Panama, *Carrasquilla 259* (DUKE, F, MO).

40. SOPHORA

Michael O. Dillon[85]

Sophora L.,[86] Sp. Pl. 373. 1753; Gen. Pl., ed. 5, 175. 1754. LECTOTYPE: *S. alopecuroides* L. (designated by Britton & Brown, 1913).

Trees, shrubs, or rarely perennial *herbs*. *Leaves* alternate, imparipinnate; leaflets alternate to subopposite; stipules linear to deltoid, caducous or absent; stipels linear, minute or absent. *Inflorescence* racemose or paniculate, terminal or axillary. *Flowers* ca. 1.0–4.5 cm long; calyx campanulate, often gibbous, the lobes 5, subequal or truncate, the upper lobes often connate; corolla white, yellow or blue violet, the standard broadly obovate or orbicular, erect or spreading, the wings oblong, oblique, the keel oblong, usually partially connate or overlapping; stamens 10, free or rarely connate basely into a ring, alternately subequal, the anthers versatile, ellipsoid, dorsifixed, ca. 1 mm long; ovary short stipitate, the ovules numerous, the style incurved, the stigma terminal, minutely capitate-penicillate. *Fruit* moniliform, terete or slightly compressed, somewhat tortulose, fleshy to woody, commonly indehiscent; seeds spherical or subellipsoid, red, yellow or brown, the hilum lateral or subapical; cotyledons thick. Chromosomes: $n = 8, 9, 11, 14, 18$.

Sophora contains about 80 species and has a worldwide distribution in tropical and temperate regions. Only one species, *Sophora tomentosa,* is found in Central America south of Mexico. This geographically widespread and morphologically variable taxon has been separated into four subspecies by recent authors (Brummitt & Gillett, 1966; Yakovlev, 1964), with the Panamanian material referable to subspecies *occidentalis*.

Literature:

Britton, N. L. & A. Brown. 1913. Illustrated Flora of the Northern United States., ed. 2, 2: 342.

Brummitt, R. K. & J. B. Gillett. 1966. Notes on the genus *Sophora* in Africa, including an Asian species found near Zimbabwe. Kirkia 5: 259–270.

Yakovlev, G. P. 1964. Novaiia systema roda *Sophora* L. i ego filogenez. Trudy Leningrad Khim.-farm. Inst. 17: 50–77.

1. **Sophora tomentosa** L.,[86] Sp. Pl. 373. 1753, non Dippel, 1893. TYPE: Ceylon, *Hermann* (BM, not seen).

1a. **Sophora tomentosa** subsp. **occidentalis** (L.) Brummitt, Kirkia 5: 265. 1966.—FIG. 45.

S. occidentalis L., Syst. Nat., ed. 10: 1015. 1759. TYPE: Jamaica, *P. Browne* (LINN, not seen; microfiche, MO).

Shrub, to ca. 3 m tall; stems puberulent to tomentose. *Leaves* 13–17-foliolate, the rachis 12–25 cm long, puberulent; leaflets opposite or subopposite, broadly

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[86] For complete synonymy see Rudd, 1972.

FIGURE 45. *Sophora tomentosa* L.—A. Habit (×½).—B. Fruits (×½).

elliptic or suborbicular, apices rounded to emarginate, the bases rounded, truncate or subcordate, 2.5–5.0 cm long, 1.5–4.0 cm wide, the upper surface puberulent, shiny; lower surface tomentulose; petiolules ca. 2 mm long, puberulent; stipules linear-deltoid, tomentulose, ca. 3 mm long, caducous; exstipellate. *Inflorescence* racemose, terminal, many flowered; bracts 3–5 mm long; bracteoles absent. *Flowers* 20–25 mm long; calyx 6–8 mm long, subtruncate, sericeous; corolla yellow, the standard 9–12 mm wide, narrowly obovate, the wings clawed, auriculate, the keel petals clawed, auriculate, fused distally. *Fruit* stipitate, subcoriaceous, cinereo-tomentulose, terete, torulose or moniliform, 1–15-seeded, 5–15 cm long, ca. 8 mm in diameter, abruptly constricted between the seeds or sometimes only slightly constricted; seeds sublustrous, light brownish, spherical or subellipsoid, 5–8 mm long, 5–6 mm in diameter. Chromosomes: $n = 9$.

Sophora tomentosa subsp. *occidentalis* is widespread throughout the West Indies, adjacent southern Texas, northeastern Mexico, the Yucatan, Belize, Panama and northern Colombia. In the Old World, it occurs on the Atlantic coasts of West Africa from Senegal to Nigeria and Sao Tome. In Panama, it is an infrequent element of the beach strand vegetation of the northern Caribbean coastal region, possibly restricted to calciferous soils.

Subspecies *tomentosa* is quite similar to subsp. *occidentalis*, the latter having leaflets with sparser pubescence of short, adpressed hairs, and the Old World subsp. *tomentosa* having leaflets with pubescence silky, curved and matted into a short tomentum.

BOCAS DEL TORO: Isla Colón, *Wedel 504* (GH, MO). Old Bank Island, *Wedel 2039* (GH, MO, US). Careening Cay, *Wedel 2807* (GH, MO, US). Nances Cay, *Wedel 2864* (GH, MO, US). COLÓN: Playa Langosta, *Correa et al. 3006* (MO). Near Portobelo, *Croat 14126* (F, MO). SAN BLAS: Isla Soskatupa, *Duke 15475* (MO, US).

41. STIZOLOBIUM

W. G. D'Arcy[87]

Stizolobium, P. Br., Civ. Nat. Hist. Jam. 299. 1756. TYPE: *S. pruriens* (L.) Med.

Labradia Swendiatavr, Arznuymitt. 1: 164. 1801. Not seen, fide Index Kewensis. LECTOTYPE: *L. pruriens* (L.) Med.
Mucuna sect. II. *Stizolobium* (P. Br.) DC., Prodr. 2: 405. 1825.
Carpopogon Roxb., Fl. Indica 3: 283. 1832. LECTOTYPE SPECIES: *C. niveum* Roxb.
Mucuna subgenus III. *Stizolobium* (P. Br.) Bauer, Fl. British India 2: 186. 1879.

Climbing or trailing *vines*, puberulent to cinereous. *Leaves* pinnate trifoliolate, the leaflets mucronate; petiolules pubescent; petioles often elongate; stipels linear; stipules caducous. *Inflorescences* axillary racemes, sometimes elongate, the flower buds narrow, the calyx with unequal teeth, the upper pair connate, the lowermost teeth longest; standard short, the wings longer than the standard, the keel tubular, apically cucullate, indurated, about as long as the wings; stamens diadelphous, the vexillary stamen free, the other 9 with the filaments connate into a tube above halfway, the free portion alternately thick and short, narrow and long; ovary pubescent, the style glabrate, the stigma minute. *Legume* oblong,

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narrow, several seeded, striate, densely tomentose, usually with stinging hairs, falsely septate, dehiscent; seeds faboid, plump to subglobose, the short hilum surrounded by an elevated elliptical caruncle, the testa thin.

Stizolobium includes about 8 species ranging across the Old World tropics to Australia. At least two species are naturalized in the Neotropics.

Stizolobium has been included in *Mucuna* by many writers, usually with hesitation, but the differences between *Stizolobium* and typical elements of *Mucuna* are manifest. Removal of *Stizolobium* from *Mucuna* still leaves *Mucuna* a heterogenous group (Verdcourt, 1971), at least when Old World species are considered. Most evident characters for separation are in the seeds. In *Mucuna* the seeds are large, globose to discoid vs. reniform to faboid (*Stizolobium*), the hilum is narrow and circumferential around more than ½ the seed vs. narrowly elliptical around less than ¼ of the seed. The legumes are seldom more than 3 times as long as wide vs. several times longer than wide. There are some floral differences as well. In *Mucuna* anthers are sometimes barbate, anthers are dorsifixed, and there is different connation of the filaments. Vegetatively, the eophylls of *Mucuna* are alternate and reduced vs. opposite, simple and cordate, foliaceous, and in *Mucuna* germination is hypogeous vs. epigeal in *Stizolobium* (Moldenke, 1933). *Mucuna* comprises mostly high climbing forest vines while *Stizolobium* comprises vines on the ground or on fence-rows, often of disturbance. In seeds of *Mucuna* the putamen is resistant to sea water decay, hence seeds are frequently found in beach drift, but seeds of *Stizolobium* have a less resistant putamen and the seeds are seldom found in beach drift (Standley & Steyermark, 1946).

Literature:

Burkill, I. H. 1935. A Dictionary of the Economic Products of the Malay Peninsula. 2 Vols. London.

Moldenke, N. 1933. Tropical American Plants. Phytologia 1: 4–18.

Piper, C. V. 1917. The Cowhage and related species. Proc. Biol. Soc. Wash. 30: 51–52.

1. **Stizolobium pruriens** (L.) Medic., Vorles. Churpffälz. Phys.-Ocon. Ges. 2: 399. 1787.—FIG. 46.

Dolichos pruriens L., in Stickman, Dios. Herb. Amb. 23. 1754; Syst. Nat. ed. 10: 1162, 1759. TYPE: Indonesia, *Rumphius*, Herb. Amb. 5, *tab. 142. 175*, not seen, fide Verdcourt 1971.
Mucuna pruriens (L.) DC., Prodr. 2: 405. 1825.
M. purita Wight in Hook., Bot. Misc. 2: 348. 1831.
Stizolobium pruritum (Wight) Piper, Proc. Biol. Soc. Wash. 30: 54. 1917.

Vine sprawling on ground or shrubs, occasionally high climbing, mostly 2–3 m long; stems fine puberulent with white or brownish stiff, curved reflexed or appressed hairs, terete but drying minutely striate. *Leaves* trifoliolate, the leaflets mostly 5–12 cm long, thin, about equal, apically obtuse, mucronate, basally obtuse to truncate, the lateral leaflets oblique, pubescent with soft hairs, densely pubescent to glabrate, mostly more so beneath, the petiolules 3–4 mm long, pilose, sometimes with a few long (1 mm) coarse hairs, petioles exceeding the leaflets, sometimes twice as long, puberulent as on the stems; stipels minute,

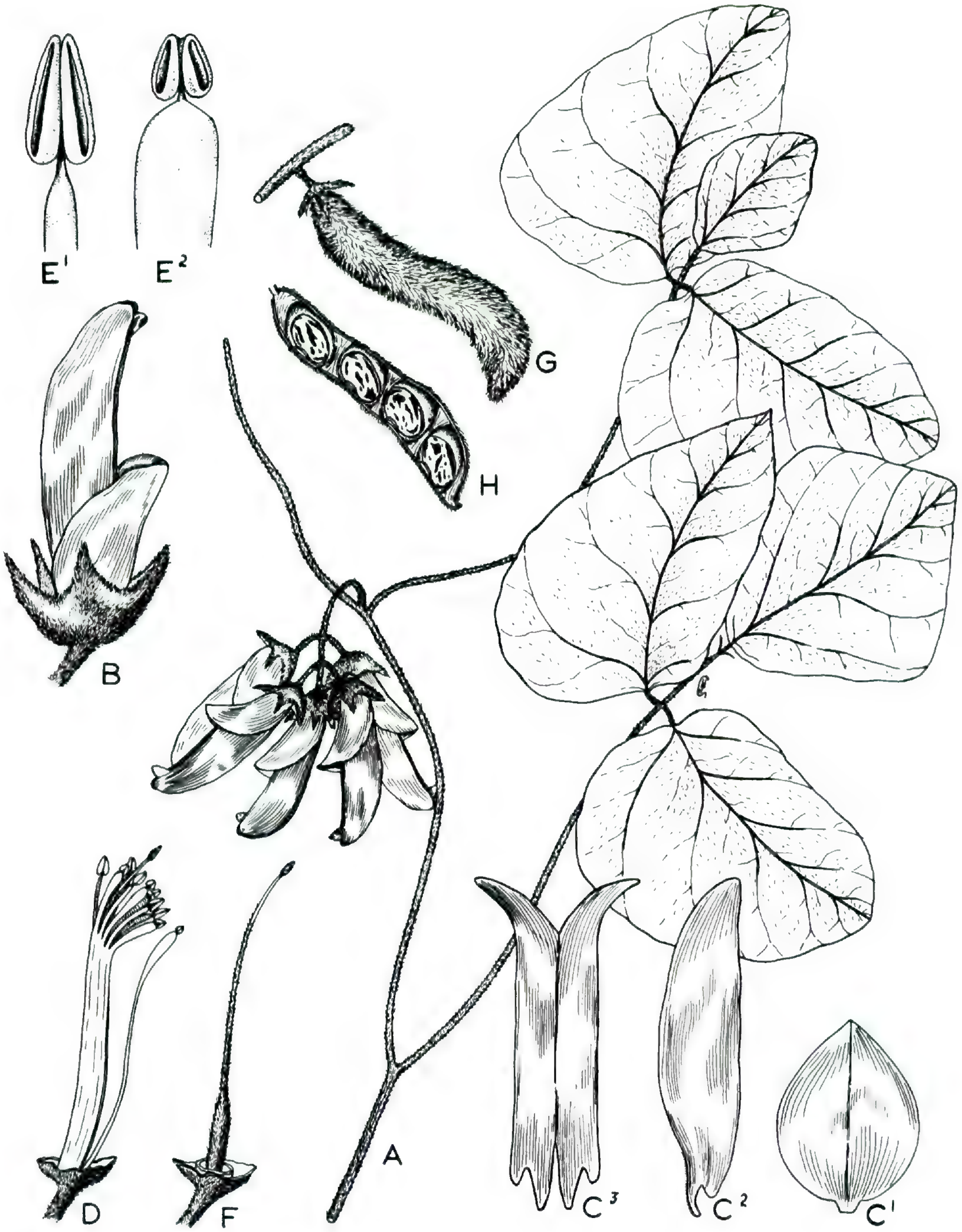

FIGURE 46. *Stizolobium pruriens* (L.) Medic.—A. Habit (×½). [After *Allen 16675A*.]—B. Flower (×1).—C. Corolla.—C¹. Standard (×1).—C². Wing petal (×1).—C³. Keel petals (×1).—D. Stamens (×1).—E. Stamens.—E¹. Large anther (×10).—E². Small anther (×10).—F. Pistil (×5). [After *Allen 975*.]—G. Fruit (×½).—H. Fruit opened to show seeds (×½). [After *Ebinger 81A*.]

scale-like 1–3 mm long; stipules drying dark, narrowly ovoid, apically linear, ca. 4 mm long, mostly pilose with ascending hairs, mostly caducous. *Inflorescences* axillary, racemes to 20(–30) cm long, mostly 5–15 flowered, the branches grey silver pubescent, the pedicels short, ca. 4 mm long, tomentose, paired on short shoots, the bracts not seen, not elongating in fruit. *Flowers* ca. 4 cm long, the calyx campanulate, the limb ca. 1 mm across, greyish or silvery velutinous, the teeth linear lanceolate, ca. 7 mm long, the lowermost longest, the upper pair united into a narrowly deltoid lip; corolla purplish and white, the standard 15–20 mm long, the tip slightly upcurved and obtuse, ovate, the wings ca. 30 mm long, much exceeding the standard, narrow, the keel slightly longer than the wings, tubular, narrow, the apex cucullate and indurated, enclosing the anthers; ovary canescent, the style glabrous, the stigma minute. *Legume* oblong to fusiform, often irregularly curved, 4–9 cm long, 10–15 mm thick, densely tomentose with stinging hairs, orange, yellow or blackish brown, mostly striate under the hairs, tardily dehiscent with false septa between the seeds; seeds several, faboid, 1–1.5 cm long, plump, variously colored, shiny, with a narrowly elliptical, elevated caruncle around the short lateral hilum, the testa hard but thin.

In fruit, this species can be confused with no other member of the Panamanian flora, for the densely woolly pods with stinging hairs often alert the observer before the plant is seen, and the faboid seeds with elevated caruncle around the hilum will separate the species from members of *Mucuna* which also have stinging hairs on the pods.

Some varieties of this species are cultivated in the Old World for forage. The pods are similar to the typical variety but lack stinging hairs. *Stizolobium pruriens* is widespread in the Neotropics but is probably native to the Paleotropics. The brittle hairs are mechanically irritating and also bear a proteolytic enzyme which is irritating. The English common name "Cow-Itch" is a corruption of the Hindu name "Kewach" (Burkill, 1935), and does not imply potential for injuring cattle. In Spanish the plant is known as "Pica-Pica" (Standley, 1928).

CANAL ZONE: W end of Gatun Lake dam, *Blum & Tyson 1999* (FSU, MO, SCZ). W edge of Cocolí, *Croat 9180* (F, MO, SCZ). Pipeline Road, 1.2 mi NW of Gamboa gate, *Croat 12736* (MO). Farfan, *D'Arcy 9628* (MO). Cocolí, *Dwyer 7229* (GH, MO, US). Madden Dam Area, *Dwyer 8377* (MO). Gamboa, *Greenman & Greenman 5164* (MO). Near Fort Clayton, *Greenman & Greenman 5185* (MO). Hills E of Curundú, *Harvey 5185* (F). Farfan Beach, *Lewis & Dwyer 58* (MO). 1 km S of Madden Dam, 80 m, *Nee 8907* (GH, MO, SCZ). Between Miraflores and Pedro Miguel, *Pittier 2496* (US). Paraíso, *Pittier 2518* (US). Balboa, *Standley* 27132 (US). Gatún, *Standley 27249* (US). Gamboa, *Standley 28453* (US). Las Cruces Trail between Fort Clayton and Corozal, *Standley 29004* (US). Río Pedro Miguel near East Paraíso, *Standley 30034* (US). Miraflores Locks, *Stern et al. 81A* (GH, MO, US). Punta Bruja, *Stevens 544* (US). Farfan Beach, *Tyson et al. 3161* (MO). Gamboa near prison, *Tyson & Lazor 6084* (FSU, PMA). CHIRIQUÍ: La Estrella, corregimiento de Bugaba, *Gonzales* 14 (MO). Las Vueltas, 1–100 m, *Koster 110* (MO). Puerto Armuelles, 20 m, *Liesner 139* (MO). COLÓN: Camino de Sardinilla, *Taylor 39* (PMA). DARIÉN: Choco village, Piji Vasal, *Folsom 4574* (MO). LOS SANTOS: 1 mi W of Tonosí, *Croat 2986* (MO). PANAMÁ: Bejuco, *Allen 975* (GH, MO, US). Cerro Cantratista, *Buitrago 30* (MO, PMA). Between Goofy Lake and Panamerican Highway, *Correa & Dressler 442* (A, MO, PMA, SCZ). Base of highway to Cerro Jefe, *D'Arcy 13440* (K, MO, SCZ). Between Panama and Chepo, *Dodge et al. 16675* (GH, MO). Chepo highway W of Río Pacora, *Duke 5893* (MO, WIS). Without other locality, *Kennedy et al. 2013* (MO, US). Taboga Island, *Macbride 2797* (US). Matías Hernández, *Pittier 6810* (GH, US). Near Panamá, *Sargent 7* (A). 2 km entrada camino a Cerro Azul, *Taylor 1* (PMA). Camino después de divisar lago de Sardinilla, *Taylor 43* (PMA). VERAGUAS: Puerto Mutis, 12 mi S of Santiago, *Tyson 5194* (FSU).

42. STYLOSANTHES

Michael O. Dillon[88]

Stylosanthes Swartz, Prodr. Veg. Ind. Occ. 108. 1788. LECTOTYPE: *S. procumbens* Swartz.

Astyposanthes Herter, Revista Sudamer. Bot. 7: 209. 1943. Based on *Stylosanthes* Swartz.

Perennial *herbs* or rarely subshrubs, 0.1–1.5 m tall; stems erect, ascending or sprawling procumbent, diffusely branched, suffruticose, terete, finely striate, unarmed. *Leaves* alternate, pinnately trifoliolate, the rachis below terminal leaflet 1–4 mm long; leaflets elliptic to lanceolate, 5–30(–40) mm long, 2–15 mm wide, apices obtuse to acute, occasionally mucronate, basally attenuate, the costas prominent; petioles 1.5–9.0 mm long; stipules amplexicaul, bidentate, pubescent, adnate with the petiole base, 3–11 nerved; exstipellate. *Inflorescence* spicate, terminal or axillary, 1–several flowered, each flower surrounded by a series of bracts and bracteoles, the outermost bracts similar to stipules and giving rise to 1–3 reduced leaflets, similar to cauline leaflets except for size, the bracts enclosing a smaller outer bracteole, usually 3 nerved, ciliate along the margin, within this a densely ciliate axis rudiment sometimes present; within this 1 or 2 inner bracteoles, deeply cleft, the apices usually long ciliate. *Flowers* 5-merous, the calyx 4–15 mm long, tubular, 5 lobed, unequal; corolla papilionaceous, yellow or yellow orange and purple striate; stamens 10, monadelphous, the filaments coalescent into a tube, splitting on vexillar side after anthesis; 5 versatile anthers alternating with 5 subbasifixed ones; ovary subsessile, the 2(3) ovules campylotropous, the placentation marginal, the style long, filiform, the stigma minute, terminal. *Fruit* a loment, biarticulate, distally fertile, proximally abortive or fertile, reticulate or muricate, beaked; seeds ovate or lenticular, compressed, light brown to black, lustrous, strophiolate, Chromosomes: $n = 10$.

Stylosanthes is composed of approximately 50 species ranging throughout tropical and subtropical America, and tropical Africa and Asia. Various species are used as fodder crops, and at least one species, *S. guyanensis,* has been employed as a cover planting to inhibit soil erosion. Hutchinson and Dalziel (1937) have reported several folk uses for *S. erecta* Beauv. in Africa including herbal smoke, aphrodisiac, decoction used in baths, and as a charm against injury in battle. No local names or uses have been recorded for the species found in Panama.

Stylosanthes hamata (L.) Taub. was reported in error from Panama (Mohlenbrock, 1957), based on *Shafer 36* (NY) from Antigua. No representatives of this taxon from Panama have been seen by the present author.

Literature:

Mohlenbrock, R. H. 1958. A revision of the genus *Stylosanthes*. Ann. Missouri Bot. Gard. 44: 299–355.

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a. Inflorescence 5 to 20 flowered; beak of loment minute, 0.1–0.5 mm long, inflexed; leaflets 10–30 mm long ..... 1. *S. guyanensis*
aa. Inflorescence 2 to 5 flowered; beak of loment 1.5–2.5(–4.0) mm long, strongly to weakly hooked; leaflets to 15 mm long.
  b. Leaflets punctate, hispidulous abaxially; distal articulation of loment ca. 2 mm long, beak ca. 1.5 mm long, strongly coiled ..... 3. *S. viscosa*
  bb. Leaflets never punctate, scarcely setose to glabrous; distal articulation greater than 2 mm long, beak 1.5–3.5(–5.5) mm long, uncinate to coiled ..... 2. *S. humilis*

1. **Stylosanthes guyanensis** (Aubl.) Swartz,[89] Kongl. Vetensk. Acad. Handl. 11: 296. 1789.—FIG. 47.

Trifolium guyanense Aubl., Hist. Pl. Guiane 776. 1775. TYPE: Guiana, *Aublet* (BM, not seen).

Suffruticose *herbs*, erect or rarely scandent, to 1 m tall, glabrous to puberulent or pilose, often hispid or setose, the trichomes viscid. *Leaflets* pinnately trifoliolate or rarely a few unifoliolate, linear lanceolate to elliptic, 10–30(–40) mm long, 2–5 mm wide, the terminal leaflet slightly larger, apically acute, mucronate, puberulent to sericeous with tuberculate based trichomes, nerves 2–8 pairs, prominent; petioles 1–10 mm long, canaliculate, puberulent to setose, the rachis 0.5–1.5 mm long; stipular sheath pilose to setose, 2–15 mm long, 3- to many-nerved, the teeth subulate, 2–10 mm long. *Inflorescence* spicate, mostly 5–20 flowered; bracts usually subfoliaceous, unifoliate, spinulose toothed, the sheaths glabrous to bristly, 3–7 mm long, 3 to 9 nerved, the outer bracteole 1, lanceolate, 2.5–3.0 mm long, acuminate, glabrous to pilose; axis rudiment none; inner bracteole 1, 2–3 mm long, acuminate, glabrous to pilose. *Flowers* yellow; calyx tube 4–8 mm long, glabrous to sparsely pubescent, the lobes 3–5 mm long, obtuse to acute, ciliate or sometimes pilose; standard 4–8 mm long, 3–5 mm wide, suborbiculate, the wings 3.5–5.0 mm long, auriculate, spurred within at the base, the keel petals 3.5–5.0 mm long, falcate. *Fruit* a loment, 1.5–2.5 mm wide, ca. 3 mm long, reticulate, glabrous, ovoid, plump, the beak minute, 0.1–0.5 mm long, strongly inflexed, only the distal articulation fertile. Chromosomes $n = 10$.

Stylosanthes guyanensis is a most variable species occupying a wide range of altitudes and habitats. Numerous subspecies, varieties and forms have been proposed; however, intergradations occur between almost all of these. Mohlenbrock (1957) recognized two subspecies within *S. guyanensis*: ssp. *guyanensis* occurs from Central America through South America into northern Argentina and also in the Antilles, while ssp. *dissitiflora* is limited to a small area in southwestern Mexico, between 3,500–5,000 feet. The latter, not occurring in Panama, is easily distinguished by its small, purplish leaflets and inflorescence of only 1–4 flowers.

CANAL ZONE: Drowned forest of Río Puente near junction with Río Chagres, *Dodge et al. 16835* (GH, MO). K-2 Road, *Dwyer 2877* (FSU). Cocolí road to Contractors Hill, *Dwyer 7229* (GH, MO). Ancón Hill, *Greenman & Greenman 5125* (MO). Forest Preserve, *Hjerting & Rahn 589* (US). Las Cruces Trail in Government Forest, *Hunter & Allen 753* (GH, MO). Empire to Mandinga, *Piper 5129* (US). Ancón Hill, *Piper 5130* (US). Between Corozal & Ancón, *Pittier 2165* (NY, US). Sosa Hill, Balboa, *Standley 26443* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29159* (US). Summit, *Standley 30068* (US). Pipeline Road NW of Gamboa, *Wilbur & Teeri 13389* (DUKE). 0.5 m from Summit Garden, *Wilbur & Weaver 11207* (DUKE, MO). Ancón Hill, *Williams 28* (NY). CHIRIQUÍ: David to Concepción, 60 m, *Burt & Koster 137* (MO). Volcán to Cuesta de

[89] For additional synonyms see Mohlenbrock (1958).

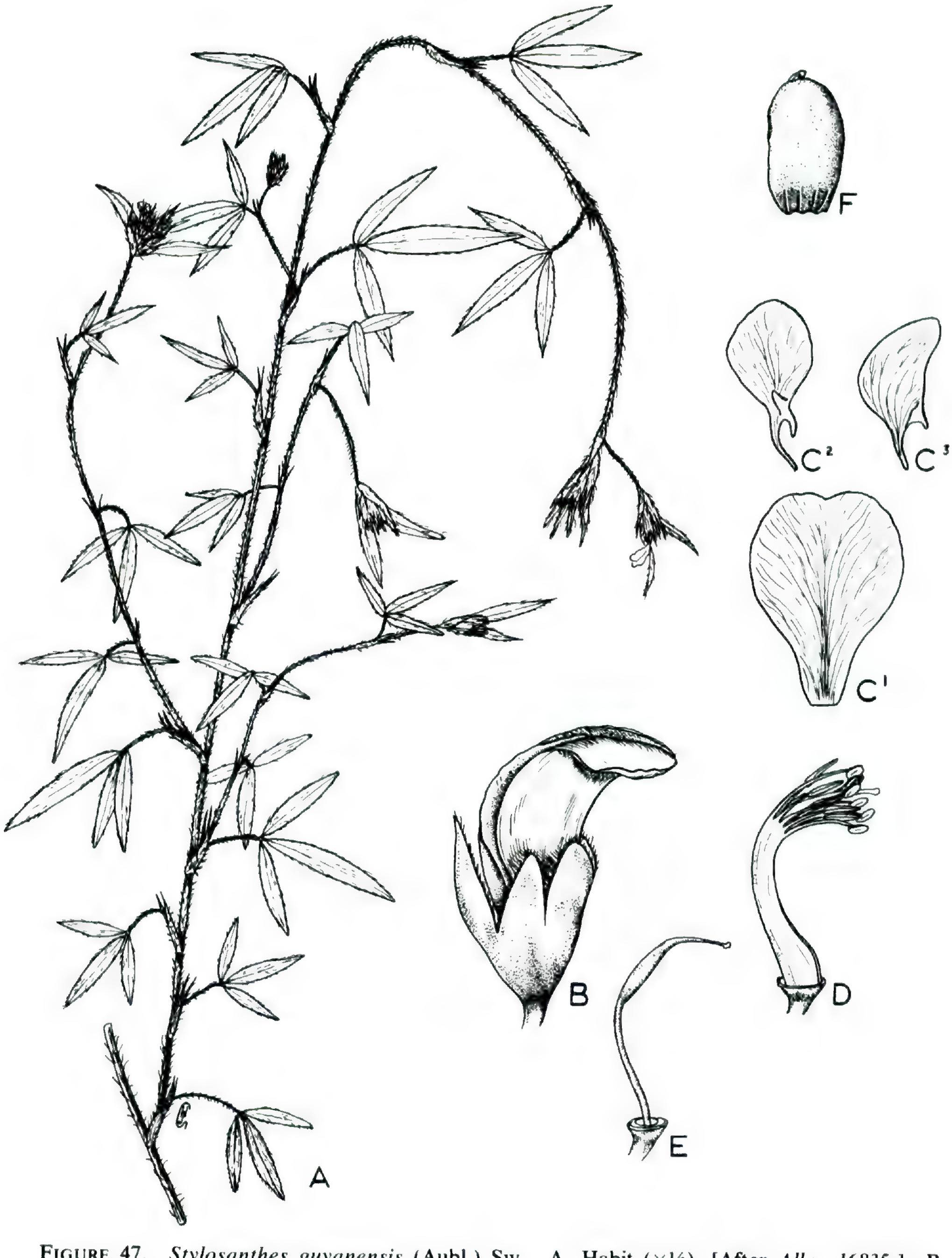

FIGURE 47. *Stylosanthes guyanensis* (Aubl.) Sw.—A. Habit (×½). [After *Allen 16835.*]—B. Flower (×6).—C. Corolla.—C^1. Standard (×4).—C^2. Wing petal (×4).—C^3. Keel petal (×4).—D. Stamens (×6).—E. Pistil (×6). [After *Greenman 5125.*]—F. Fruit (×12). [After *Hunter & Allen 753.*]

Piedras, 980 m, *Burt & Koster 160* (MO). Road to Cerro Punta, ca. NW of Hato de Volcán, *Correa 1371* (MO, PMA). La Popa above Boquete, 4500 ft, *D'Arcy & D'Arcy 6366* (MO). E side of Cerro Pando, near Río Chiriquí Viejo, 600 ft, *D'Arcy & D'Arcy 6613* (F, GH, MO, NY). Lava fields near town of Volcán, 4600 ft, *Duke 9206* (MO, US). Cerro Horqueta, ca. 1500 m, *Duke et al. 13648* (MO).

Llanos Francia, *Dwyer & Lallathin 8716* (MO). Between Santiago and San Félix, *Folsom & Collins 6921* (MO). 311 km W of Panama City, from Boquete to 3 m N, 3300–4200 ft, *Lewis et al. 637* (GH, MO). Alto Boquete, 1125 m, *Partch 69-52* (MO). Boquete, 5500 ft, *Terry 1264* (F, GH, MO, US). 5 mi NE of El Hato del Volcán towards Volcán de Chiriquí, *Wilbur et al. 11857* (DUKE). 6 m W of San Lorenzo, *Wilbur et al. 15393* (DUKE). COCLÉ: Natá, 50 m, *Allen 838* (MO, NY, US). 3 mi NE of Antón, *D'Arcy & Croat 4112* (MO, PMA). Penonomé, Llanos, *Ebinger 1099* (F). 2 m E of Río Hondo along Panamerican Highway, *Gentry 2915* (MO). Penonomé, *Williams 148, 167* (both NY, US). HERRERA: Between Las Minas and Pesé, *Burch et al. 1336* (F). Near Ocú, 100–200 m, *Burt & Koster 87* (MO). Chepo de Las Minas, *Folsom et al. 7062* (MO). 10 mi S of Ocú, *Tyson et al. 2820* (MO, SCZ). PANAMÁ: Near Chepo, 0–100 m, *Burt & Rattray 14* (MO). Near El Valle, 450 m, *Burt & Rattray 28* (MO). Road to El Valle close to Interamerican Highway, 0–100 m, *Burt & Rattray 38A* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5090* (MO). Playa near Río Mar, *Ebinger 507* (F). 7 m W of Chepo, *Gentry & Tyson 1633* (MO). Sabanas near Chepo, 30 m, *Hunter & Allen 75* (GH, MO). Río Tocumen, N of Chepo Road, *Hunter & Allen 222* (F, GH, MO, NY). Cerro Campana, *Lewis et al. 3071* (COL, MO, UC). Without exact locality, *Maurice 790* (US). Taboga Island, *MacBride 2818* (F, GH, US). Pacora-Chepo highway, *McDaniel 8181* (FSU, DUKE). Sabanas N of Panama City, *Paul 572* (US). Between Olá and Corteza, *Pittier 5098* (F). Road to Chepo, sea level, *Semple Pa-4* (US). Las Sabanas, *Standley 25837* (MO, US). Savanna E of Río Tocumen, *Standley 26510* (US). Juan Franco Race Track, *Standley 27726* (US). Taboga Island, *Standley 28013* (US). Between Matías Hernández and Juan Diaz, *Standley 32077* (US). Between Cerro Azul and Galaria Barleta, *Taylor 4* (MO, PMA). Ca. 9 km SE of El Valle de Antón, *Wilbur et al. 11166* (DUKE, GH, MO, US). 10 km from Interamerican Highway leading to El Valle de Anton, *Wilbur et al. 15593* (DUKE). VERAGUAS: Ca. 5 mi NE of La Mesa, *Blum & Tyson 631* (FSU, MO, SCZ). Near La Pena, 0–100 m, *Burt & Rattray 84* (MO). Without exact locality, *Duke 6179, 6198* (both MO). Savanna 10 m W of Santiago, *Duke 13647(3)* (NY). 270 km W of Panama City, between Santiago & San Félix, *Folsom & Collins 6910* (MO). Santiago-Santa Fé Road, 18 km S of Santa Fé, 400 m, *Nee 8164* (MO).

2. **Stylosanthes humilis** H.B.K., Nov. Gen. Sp. Pl. 6: 506. 1823. TYPE: Venezuela, *Humboldt & Bonpland,* not seen. Non *S. humilis* Rich. ex Hemsl.

Astyposanthes humilis (H.B.K.) Herter, Revista Sudamer. Bot. 7: 209. 1943.

Herbs, often suffruticose; stems ascending to prostrate, to 0.5 m tall, branched, puberulent to hirsute. *Leaflets* lanceolate to elliptic, mucronate, acute, the adaxial surface and the margins sparsely setose to glabrous, 3–4 pairs of conspicuous nerves; terminal leaflet 5–15(–20) mm long, 2–4 mm wide; petioles 2.5–5.0 mm long, canaliform, setaceous, the rachis 1.5–4.0 mm long; stipular sheath 3–5 mm long, short bristly, 5–7 nerved, the teeth subulate, 2.5–3.5 mm long. *Inflorescence* spicate, 3–4 flowered; bracts 1–3 foliolate, the sheath 2.5–4.5 mm wide, bristly, 5–9 nerved, the teeth 2–3 mm long; outer bracteole 2.5–3.0 mm long, the apex ciliate; axis rudiment none; inner bracteole 1, 2.0–2.5 mm long, the apex ciliate. *Flowers* yellow; calyx tube 4–5 mm long, the lobes acute, ca. 1.5 mm long; standard suborbiculate, spurred within at the base, 3–4 mm long; wings 3–4 mm long, clawed and auriculate at the base; keel petals 3.0–3.5 mm long, falcate. *Fruit* a loment, 1.5–2.5(–4.0) mm long, 1.5–2.5 mm wide, reticulate nerved, usually puberulent, rarely pilose, only the distal articulation fertile, the beak strongly uncinate to coiled, 1.5–3.5(–5.5) mm long. Chromosomes $n = 10$.

Stylosanthes humilis is quite variable in size and shape of the leaflets, and in the size of the loments. The species ranges from central Mexico through Panama to Colombia, Venezuela, and Brazil; it also occurs in the Antilles and is adventive in Malaysia and Australia.

In Panama, this species generally occurs at elevations below 150 m, and it is

distinguished by its glabrate, apunctate leaflets and the elongate beak of the terminal articulation.

CANAL ZONE: Cocolí Road to Contractors Hill, *Dwyer 7213* (MO). La Boca, *Mori & Kallunki 3687* (MO). Corozal, *Standley 27403* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29191* (US). Albrook Air Force Base, *Tyson & Lazor 6013* (FSU, PMA). CHIRIQUÍ: Near David, site 64, *Burt & Koster 133* (MO). Road to Divala, site 74, *Burt & Koster 149* (MO). Frances Arriba School, *Lewis et al. 655* (GH, K, MO, UC, US). David airport, *Lewis et al. 753* (GH, MO). 5 km S of Las Lomas, *McCorkle C-25* (FSU, SCZ). David, *Rattray 3* (MO). COCLÉ: Near Divisa, *Burt & Koster 96* (MO). Aguadulce, *Pittier 4837, 4983* (both US). COLÓN: 0.7 m NE of bridge over Río Piedras on road from Portobelo, *Nee & Mori 3650* (MO). PANAMÁ: Between Panama and Chepo, *Dodge et al. 16700* (MO). Río Mar, *Godfrey 2321* (FSU, SCZ). Las Sabanas, *Heriberto 297* (US). 7 mi S of Campana, *McDaniel 8339* (DUKE, FSU). Las Sabanas, *Standley 25882, 25914* (both US). Near Punta Paitilla, *Standley 26293* (US). Corozal Road, *Standley 26794* (US). Vicinity of Juan Franco Race Track, *Standley 27730* (US). Río Tocumen, *Standley 29474* (US). Las Sabanas, *Standley 41178* (US). VERAGUAS: Hills W of Soná, *Allen 1054* (GH, MO, US). Davisa/Santiago, 0–100 m, *Burt & Rattray 75, 78, 79* (all MO). Panamerican Highway 0.5 km W of Highway 50 turnoff to Ocú, 30 m, *Nee 8002* (MO). 2 km NW of Atalaya, *Nee 8244* (DUKE, MO, US).

3. **Stylosanthes viscosa** (L.) Swartz, Prod. Veg. Ind. Occ. 108. 1788.

Hedysarum hamatum β viscosa L., Plant. Jamaic. Pug. 20. 1759. TYPE: Jamaica, *Sloane* (BM, not seen).

Herbs, stems ascending and spreading or prostrate and matted, much branched, to 1 m long, densely pubescent with viscid trichomes. *Leaflets* lanceolate to elliptic, to 15 mm long, 4 mm wide, acute to obtuse, the abaxial surface punctate, reddish, hispidulous, 2–4 pairs of conspicuous nerves; petioles 2.5–5.0 mm long, hispidulous, viscid, the rachis 1–2 mm long; stipular sheath 3.5–5.5 mm long, 3–5 nerved, the teeth subulate, hispidulous, viscid. *Inflorescence* spicate, 2–5 flowered; outer bracts usually trifoliolate, the inner bracts unifoliolate, the sheath equaling or slightly exceeding the teeth, hispidulous, viscid, 5–7 nerved; outer bracteole 1, 2.5–3.0 mm long, the apex ciliate; axis rudiment none; inner bracteole 1, 2.5–3.0 mm long, the apex ciliate. *Flowers* yellow, calyx tube 3–7 mm long, glabrous to puberulent; standard suborbiculate, 4–7 mm long, the wings 4–5 mm long, auriculate, spurred within at the base, the keel petals 3–4 mm long, falcate. *Fruit* a loment, 2–4 mm long, ca. 2 mm wide, the distal articulation fertile, reticulate nerved, puberulent, beak ca. 1.5 mm long, strongly uncinate to coiled.

Stylosanthes viscosa ranges from western Mexico through central and northern South America to the eastern coast of Brazil. This species is frequently collected in Panama, and it is distinctive with its highly punctate leaf undersurface appearing reddish.

COCLÉ: 3 mi NE of Antón, *D'Arcy & Croat 4111* (MO). E of Natá, *Duke 12386 (3)* (NY). Penonomé, *Ebinger 1099a* (F, MO). Road to El Valle, *Ebinger 1099b* (MO). Aguadulce, *McDaniel & Cooke 14764* (FSU); *Pittier 4983* (GH). Río Hato Military Reserve, *Tyson & Blum 2558* (FSU, MO, SCZ). HERRERA: Hills between Las Minas and Pesé, 9–1200 m, *Burch et al. 1336* (F, MO). Ocú, ca. 5 m S, *Stern et al. 1689* (MO, US). 10 mi S of Ocú, *Tyson et al. 2852* (FSU, SCZ). LOS SANTOS: Las Cruces to Macaracas, 100–200 m, *Burt & Koster 102* (MO). PANAMÁ: Road to El Valle near Interamerican Highway, 0–100 m, *Burt & Rattray 38* (MO). Near beach at Nueva Gorgona, *Duke 4537* (MO). Playa near Río Mar, *Ebinger 507* (F, MO). 7 m W of Chepo, *Gentry & Tyson 1633* (SCZ). VERAGUAS: Without exact locality, *Bristan 795* (MO). La Mesa, *Tyson 6049* (FSU, SCZ).

43. TEPHROSIA

Peter S. White[90]

Tephrosia Pers.,[91] Syn. Pl. 2: 328. 1807. Nomen conserv. contra *Needhamia* Scop., *Reineria* Moench. LECTOTYPE: *T. villosa* (L.) Pers. (*Cracca villosa* L.)

Needhamia Scopoli, Introd. 310. 1777. Nomen rejic. contra *Tephrosia*. TYPE: *Vicia littoralis* Jacq. = *Tephrosia littoralis* (Jacq.) Pers.

Reineria Moench., Suppl. Meth. Bot. Pl. 44. 1802. Nomen rejic. contra *Tephrosia*. TYPE: *R. reflexa* Moench = *Tephrosia reflexa* (Moench.) DC.

Cracca L., Sp. Pl. 752. 1753; Gen. Pl., ed. 5. 1754. Nomen rejic. contra *Cracca* Benth. TYPE: *Cracca villosa* L. Not *Cracca* Hill, Brit. Herb. 285. 1756. TYPE: not designated. Nor *Cracca* Medic., Vorl. Chrupf. Phys.-Ökon. Ges. 2: 359. 1787. TYPE: *Cracca benghalensis* Medic. = *Vicia benghalensis* L. Nor *Cracca* Benth., *in* Benth. et Oerst. Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn 1853: 8. 1853. Nomen conserv. contra *Cracca* L. TYPE: *Cracca glandulifera* Benth.

Perennial *herbs* or *shrubs*, erect or trailing; base woody; roots usually heavy; pubescence usually close and dense. *Leaves* alternate, odd pinnate; leaflets (1–)3–41, almost always hairy, at least beneath; secondary veins parallel, distinctively sharply ascending, ca. 30° to the midrib; rachis usually grooved above; estipellate but tufts of hairs sometimes present in the axils; stipulate. *Inflorescence* terminal or axillary, sometimes apparently leaf opposed but actually terminal and overtopped by the adjacent axillary branch, racemose, elongate, the flowers in clusters of 2–6 or more at the nodes, each cluster usually with a primary bract at the base and each pedicel with a secondary bract at the base. *Flowers* red, purple, or white, petals clawed, the standard hairy outside, often densely so, the wings about as long as the standard and usually basally adnate to the keel; stamens usually diadelphous, the vexillary stamen frequently fused to the stamen tube above, free at the base; ovary sessile, slender, usually hairy, the style bearded above in many species, or glabrous. *Fruit* flat, linear or oblong, straight or slightly curved, sessile, often obliquely contracted distally and beaked on the upper side by the persistent style base, continuous within or slightly septate, the valves usually coiling in dehiscence; seeds several to many, circular to oblong, flattened.

Tephrosia is a genus of 250–400 species in temperate and tropical regions of North and South America, Africa, southern Asia, and Australia. It reaches its highest diversity in dry open habitats of Mexico. The four species reported from Panama are also characteristic of open habitats. Many species produce rotenone and related compounds which are used as fish poisons and insecticides, and at least several species have been cultivated in the New World tropics for these purposes. *Tephrosia* has also been planted as a cover crop and green manure. Chromosomes: $2n = 22$ (Wood, 1949).

The history of the names *Tephrosia* Pers., *Cracca* L., *Cracca* Benth., and *Cracca* Medic. may be confusing as presented in the synonymy above and is explained more fully below (see also Wood, 1949). In *Species Plantarum* (1753), Linnaeus described six species in the genus *Cracca* L. He subsequently (1759)

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[91] For more complete synonymy see Wood (1949). Only the above names relate directly to Panamanian plants.

submerged this genus in *Galega*. Soon it was recognized that *Galega* was a heterogeneous catchall of species, and segregate genera were proposed, one of which was *Tephrosia* Pers. (1807). At this point *Tephrosia* included all the original six *Cracca* L. species plus some other elements. Some of the included elements were later seen as extraneous to *Tephrosia* and were removed to other genera, leaving *Tephrosia* Pers. taxonomically equivalent to the original *Cracca* L. Other species were placed in *Tephrosia* by several workers.

A new use of the name *Cracca* occurred when Bentham (1853) used the name for some of the original discordant elements in *Galega*. Confusion was heightened when Otto Kuntze, recognizing the priority of *Cracca* L., transferred all *Tephrosia* Pers. species to *Cracca* L. For the species of *Cracca* Benth., Kuntze proposed the genus *Brittonamra* Kuntze.

Yet a third use of the name was *Cracca* Medic. (1787) which was resurrected by Alefield in 1862 for species of *Vicia* L. Thankfully, this use of the name was more or less ignored, although Alefield introduced further confusion by proposing the name *Benthamantha* Alef. for the species of *Cracca* Benth. Except for *Cracca* Medic., these names were all in current use. *Tephrosia* Pers. and *Cracca* L. were in use for one group of plants; *Cracca* Benth., *Brittonamra* Kuntze and *Benthamantha* Alef. were in use for a second group of plants. Resolution occurred when *Tephrosia* Pers. and *Cracca* Benth. were conserved. *Tephrosia* Pers. is conserved against *Needhamia* Scopol. (1777) and *Reineria* Moench. (1802). *Cracca* L. is rejected against *Cracca* Benth., and is unavailable for rejection against *Tephrosia* Pers. because *Cracca* Benth. (1853) is of a later date than *Tephrosia* Pers. (1807). Hill, in his *British Herbal* (1756), had also published *Cracca* (=*Vicia* L.). Like the later *Cracca* Medic. (1787; TYPE: *Vicia benghalensis* L.), this use of *Cracca* was more or less ignored.

Cracca Benth. has been confused taxonomically with *Tephrosia* (=*Cracca* L.) but in *Cracca* Benth. the leaflets are stipellate, the wing petals free, the fruit septate, and the flowers often yellowish. *Tephrosia* is distinctive in the sharp angle of the secondary veins of the leaflets, the hairiness on the outside surface of the standard, and the often bearded style.

Literature:

Wood, C. E., Jr. 1949. The American barbistyled species of *Tephrosia* (Leguminosae). Rhodora 51: 193–231; 233–302; 305–364; 369–384; pls. 1152–1155.

a. Low or trailing, weak, herbaceous plants; inflorescences often appearing leaf opposed; style glabrous or only ciliate at the apex; leaflets 1–3 cm long, 0.1–0.3 cm wide ---------- 4. *T. tenella*

aa. Upright, stout herbs or shrubs; inflorescence evidently axillary or terminal; style barbate above; leaflets 2–8 cm long, 0.5–2.0 cm wide.

b. Leaflets 5–13, oblong with cuneate base, thick; leaves and hypanthium silvery silky; calyx lobes 3–6 mm long ---------- 2. *T. nitens*

bb. Leaflets 15–41, narrowly elliptic, the base thinner; leaves and hypanthium with usually yellowish to brownish hairs; calyx lobes less than 3 mm long.

c. Lateral lobes of calyx obliquely and abruptly acute or acuminate, unlike the lower lobe in shape ---------- 3. *T. sinapou*

cc. Lateral lobes of calyx acute to acuminate, symmetrically tapered and approximately the same shape as the lower lobe ---------- 1. *T. multifolia*

1. **Tephrosia multifolia** Rose, Contr. U.S. Natl. Herb. 1: 320. 1895. TYPE: Mexico, *Palmer 1364* (US, holotype; isotypes GH, NY).

Cracca multifolia (Rose) Rose, Contr. U.S. Natl. Herb. 12: 270. 1909.
C. arcuata Rydb., No. Amer. Flora 24: 166. 1923. TYPE: Mexico, *Nelson 4193* (US, holotype; isotype GH).
C. heydeana Rydb., No. Amer. Flora 24: 166. 1923. TYPE: Guatemala, *Heyde & Lux* (D. Smith dist. no. *6111*) (NY, holotype; isotypes GH, US).
Tephrosia heydeana (Rydb.) Standley, J. Wash. Acad. Sci. 17: 167. 1927.
T. arcuata (Rydb.) Standley, Publ. Field Columbian Mus., Bot. Ser. 4: 213. 1929.

Shrubs or erect *herbs* to 2.5 m tall, much branched; stems, leaves, and inflorescence pubescent, pilose, or velvety. *Leaves* to 35 cm long; leaflets (15–)21–31(–40), linear, oblong or narrowly elliptic, 2–6 cm long, 0.5–1.2 cm wide, the middle leaflets often the longest, rounded to somewhat acute basally and apically, mucronulate, paler green and more densely pubescent beneath, the main secondary veins 10–15 on each side, these and the midrib slightly raised beneath; petiole 1.5–3.0 cm long; rachis grooved, 5–25 cm long. *Inflorescences* terminal and axillary, to 20 cm long; peduncle 2–9 cm long, the nodes 20–50, buds to 7 per node; primary bracts 5–10 mm long; secondary bracts 4 mm long; pedicels 4 mm long, slender. *Flowers* drying to 15 mm long; calyx strigose, 3–6 mm long, the lower and 2 lateral teeth subequal, narrowly triangular to acuminate, the upper teeth connate, shorter, the teeth approximately equaling the tube; petals clawed, apparently white to pink, the standard circular to oblong, ca. 15 mm long, the claw to 3 mm long, densely covered with brown appressed hairs on the back, the wings narrow, oblong, ca. 15 mm long, the claw to 3 mm long, slightly adherent to the keel; keel narrow, oblong, to 5 mm wide, the claw to 3 mm long; staminal tube 10–15 mm long, the vexillary stamen connate in part, basally free; ovary silky, linear, ovules 8–10, the style hairy above. *Fruit* 5–6 cm long, 5 mm wide, widest toward the tip, flattened, slightly upcurved, velvety, the style base persistent, calyx persistent but somewhat torn, the 2 valves twisting on dehiscence; seeds 6–10, brown, oblong, 3 mm long.

Tephrosia multifolia is found from Mexico southward throughout Central America, but is apparently absent from South America. It has been collected in open habitats in three provinces of Panama.

Tephrosia multifolia is similar in appearance and apparently closely related to *T. sinapou*. The most easily differentiated character separating the two is the shape of the lateral calyx lobes which are symmetrical and narrowly triangular in *T. multifolia* and oblique, asymmetrical, and abruptly acute in *T. sinapou*. The latter also tends to have narrower leaflets with more secondary veins, pubescence more densely velvety and browner in color, and the calyx larger and heavier in appearance. Both species are cultivated for use as fish poisons and insecticides.

CANAL ZONE: Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 5125* (US). CHIRIQUÍ: Near Las Lomas, 0–100 m, *Burt & Koster 129* (MO). Boquete, *Davidson 591* (F, GH, MO, US). Between Hato del Jobo and Cerro Vaca, 700–1000 m, *Pittier 5419* (GH, NY, US). HERRERA: Near Las Minas, 320 m, *Burt & Koster 92* (MO). VERAGUAS: Tienda Santa Ana (La Yeguada), *Escobar et al. 291* (MO). El Embalsadero, 8 mi W of Santiago, *Tyson 6085* (FSU, MO, SCZ).

FIGURE 48. *Tephrosia nitens* Seem.—A. Habit (×⅔).—B. Flower (×2).

2. **Tephrosia nitens** Benth. ex Seem., Bot. Voy. Herald 107. 1853. TYPE: Panama, *Seemann 1036* (K, not seen; photo F, MO, NY; possible isotype at GH).—FIG. 48.

Cracca nitens (Benth. ex Seem.) Kuntze, Rev. Gen. Pl. 1: 175. 1891.
Tephrosia nitens var. *lanata* Micheli in Dur. and Pitt., Bull. Bot. Soc. Belgique 30(1): 286. 1891. TYPE: Costa Rica, *Pittier & Tonduz 3809* (holotype US; isotype B, not seen; photo F, MO).
Tephrosia albida Brandegee, Univ. Calif. Publ. Bot. 10: 406. 1924. TYPE: Chiapas, Mexico, *Purpus 9136* (US, not seen).

Erect *herb* or sparsely branched *shrub* to 3 m tall; stems strigose to villous. *Leaves* usually 5–10 cm long, leaflets 5–13, ascending, 2–8 cm long, 0.5–2.0 cm wide, the terminal leaflet largest, oblong, retuse, the base cuneate, thick, glabrate above, silvery silky beneath; petiolules 2–3 mm long; petiole grooved, 3–5 mm long; rachis grooved, 1–5 cm long; stipules narrow to triangular, deciduous to apparently persistent, to 8 mm long. *Inflorescences* terminal and axillary, to 50 cm long, flowers 5–7 per node, apparently never all maturing fruit, nodes to 50 per inflorescence; bracts narrow, deciduous; pedicels to 8 mm long. *Flowers* drying 1.5–2.0 cm long; calyx 6–9 mm long, the lobes long acuminate, subequal, 4–7 mm long; petals white to rose purple, the standard oblong to circular, 15–20 mm long, 15 mm wide, silky on the back, often notched at the tip, the claw to 3 mm long, the wings oblong, to 2 cm long and 4 mm wide, the claw to 4 mm long, the keel to 15 mm long, the claw to 4 mm long; staminal tube 10–15 mm long, the vexillary stamen connate in part, free at the base; ovary silky, to 15 mm long and 1 mm wide, the margins thickened. *Fruit* linear, flattened, 5–6 cm long, 0.5 cm wide, evenly tapered to the persistent style base, not septate but the flat surface often indented between the seeds, pubescent; seeds 9–13, nearly circular, compressed, ca. 2.5 mm across, dark brown.

Tephrosia nitens is found from southern Mexico to Brazil. This is a distinctive and attractive species both in flower and in leaf. All but one of the Panamanian collections seen are from Taboga Island, which is the type locality. Chromosomes: $2n = 22$ (Wood, 1949).

PANAMÁ: Taboga Island, *Allen 110* (GH, MO, NY), *1276* (GH, MO, US); *Killip 3174* (US); *Macbride 2830* (F, US); *McDaniel & Cooke 12903* (FSU); *Miller 2026* (US); *Pittier 3571* (NY, US); *Standley 27999* (US). Cerro Campana, ca. 2500 ft, *Tyson 6439* (MO, SCZ).

3. **Tephrosia sinapou** (Buchoz) A. Chev., Compt. Rend. Hebd. Séances Acad. Sci. 180: 1522. 1925. (As *T. singapou*.)

Galega sinapou Buchoz, Hist. Univ. Regne Vég., *pl. 994*. 1775. TYPE: Buchoz diagnostic plate.
G. sericea Lam., Encycl. Méth. Bot. 2 (part 2): 596. 1788. TYPE: not established. Not *Galega sericea* Thunb. (1800), nor *G. sericea* Buch.-Ham. (1822), nor *Tephrosia sericea* (Thunb.) Pers. (1807), nor *T. sericea* Baker (1871).
G. toxicaria Swartz, Prod. Veg. Ind. Occ. 108. 1788. TYPE: West Indies, *Swartz*, not seen.
Tephrosia toxicaria (Swartz) Pers., Syn. Pl. 2: 329. 1807.
T. emarginata H.B.K., Nov. Gen. Sp. Pl., (ed. folio) 6: 361; (ed. quarto) 6: 461. 1824. TYPE: Venezuela, (P, not seen; microfiche MO; probable isotype B, not seen).
T. schiedeana Schlecht., Linnaea 12: 299. 1838. TYPE: Mexico, (NY, not seen; isotype GH).
Orobus sericeus Sess. et Moc., Natureleza (Madrid) II, 1: app. 118. 1889. TYPE: Mexico, not seen.
Cracca toxicaria (Swartz) Kuntze, Rev. Gen. Pl. 1: 175. 1891.
C. schiedeana (Schlecht.) Standley, Contr. U.S. Natl. Herb. 23: 474. 1922.

Shrubs or erect perennial *herbs* to 1 m tall; stems usually ridged and densely velvety with yellowish-brownish pubescence. *Leaves* to 30 cm long; petioles 2–5 cm long; rachis 10–25 cm long; leaflets 17–41, most often 25–35, narrowly elliptic to linear, mucronate, 4–6 cm long, 0.5–1.5 cm wide, pubescent above, more densely pubescent and paler beneath; leaflets with the 15–20 pairs of main side nerves sometimes obscured by pubescence beneath; petiolules ca. 2 mm long; stipules linear, to 15 mm long, apparently persistent. *Inflorescences* terminal and axillary, to 30 cm long, the peduncle 2–8 cm long, the nodes 15–25 or more, the buds 2–6 per node; bracts linear, to 8 mm long; pedicels 2–5 mm long. *Flowers* drying to 20 mm long; calyx densely hairy, 5–8 mm long, the lobes about equaling the tube, the lower lobe symmetrically tapered, narrow triangular, the lateral lobes unlike the lower lobe, abruptly and obliquely narrowed to an acute or sometimes acuminate tip; petals apparently white to pink, the standard circular to oblong, ca. 15 mm long, densely hairy on the back, the claw to 3 mm long, the wings narrow, to 15 mm long, the claw 3 mm long, slightly adherent to the keel, the keel narrow, oblong, to 17 mm long, the claw to 4 mm long; staminal tube 10–15 mm long, the vexillary stamen adnate to the tube for part of the length, basally free; ovary silky, linear, the ovules 10–13, the style hairy above. *Fruit* more or less straight, linear, to 5 cm long and 5 mm wide, hairy; calyx persistent, but somewhat torn; seeds 8–13, oblong, 3.0–3.5 mm long, brown, apparently often faintly mottled.

This plant is similar in appearance to *T. multifolia* (see above under *T. multifolia*). *T. sinapou* is found in Mexico, Central America, the West Indies, and South America. *T. sinapou* has been cultivated for use as a fish poison apparently throughout the New World tropics.

The type of *Galega sericea* Lam. is possibly one of two collections in the Lamarck Herbarium (P-LAM, not seen; microfiche, MO). Lamarck (Encycl. 2 [part 2]: 596) also lists a variety "beta" and refers to having seen a Jussieu specimen. This latter may be the collection that bears the name "*Galega sericea*" in the Jussieu Herbarium (P-JU; microfiche, MO).

The plates in Buchoz's (also spelled Bu'choz and Buch'oz) work are not indexed. They are numbered as follows: "mille" (Arabic numerals, lower left corner); "Cent." (Arabic numerals, lower right corner); "Dec." (Arabic numerals, upper right corner); and "Pl." (Roman numerals, upper left corner). There is no "Cent." zero nor a "Dec." zero; hence, plate 994, on which the name *Tephrosia sinapou* is based, is numbered as "Cent. 10," "Dec. 10.," "Pl. IV." This system can be confusing in trying to locate a particular plate.

DARIÉN: El Real, *Duke 4941* (MO). Puerto St. Dorothea, *Dwyer 2274* (GH, MO, SCZ). SAN BLAS: Ailigandí River, *Duke & Bristan 338* (MO, NY).

4. **Tephrosia tenella** A. Gray, Pl. Wright. 2: 36. 1853. TYPE: "San Pedro, Sonora," now Arizona, *Wright 966* (GH holotype; isotypes MO, US).

Weak, thin stemmed, trailing *herbs* with sparse pubescence. *Leaves* 2–8 cm long; leaflets 5–13, rarely to 21, linear to linear oblong, 1–3 cm long, 1.0–2.5 mm wide, rounded and mucronate at the tip, acute at the base, the secondary veins ascending and inconspicuous; rachis to 6 cm long, grooved, loosely strigose;

petiolules ca. 0.5 mm long; petioles 0.5–2.0 cm long, grooved, strigose, estipellate but tufts of hairs present in the axils; stipules subulate, ca. 1–3 mm long. *Inflorescence* opposite the leaves or axillary, to 15 cm long, loosely hairy, the nodes distant, 1–2 flowers or fruits per node; bracts ca. 2 mm long, subulate; pedicels 3–5 mm long. *Flowers* drying to 10 mm long, the calyx 4–5 mm long, the tube campanulate and somewhat longer than the narrowly triangular lobes; standard circular to reniform, 10–12 mm long, puberulent, the claw to 3 mm long, the wings oblong, to 11 mm long and 5 mm wide, longer than the keel, the claw ca. ½ the length of the blade, slightly adherent to the keel, the keel to 7.5 mm long, ca. 3.5 mm wide; staminal tube ca. 5.5 mm long, vexillary stamen united briefly to the tube and basally dilated to ca. 1 mm wide; ovary narrowly oblong, short appressed hairy, the style to 3 mm long, glabrous except ciliate towards the apex. *Fruit* linear oblong, flattened, 3–5 cm long, ca. 0.5 cm wide, pubescent, the valves twisting on dehiscence; calyx persistent; seeds 3–8, oblong, ca. 3 mm long.

This species has been reported from the southern United States, Mexico, Central America, and the West Indies. The taxonomy of the glabrous styled Tephrosias awaits monographic study. Several names have been used in this group, at least some of which refer to distinct species. Only a more detailed study than that possible here will elucidate the relationship of this taxon to *Tephrosia ascendens* (1837); *T. brandegei* (1923); *T. corallicola* (1951); *T. curtissii* (1962); *T. leptostachya* (1825); *T. littoralis* (1807); *T. vicioides* (1838); and *T. wallichii* (1831).

Tephrosia tenella apparently sometimes behaves as an annual. It is unique among Panamanian Tephrosias in this regard.

COCLÉ: Olá, 100–350 m, *Pittier 5044* (GH, US). HERRERA: Ocú, *Ebinger 1079* (MO, SCZ, US).

44. TERAMNUS

W. G. D'Arcy[92]

Teramnus P. Br., Civ. Nat. Hist. Jam. 290. 1756. TYPE: *T. uncinatus* (L.) Swartz.

Twining *vines*, mostly pubescent. *Leaves* pinnate trifoliolate, the leaflets mostly broadly or narrowly ovate, mucronate; stipels subulate; stipules narrow, striate. *Inflorescences* axillary racemes; peduncles slender, often elongate, several flowered; bracteoles 2, subtending the calyx or just below the top of the pedicel; pedicels short, pubescent. *Flowers* inconspicuous; calyx tubular, lobed about ½ way down, the lobes subulate, subequal or the upper pair fused and longer; standard emarginate, glabrous, exserted slightly from the upper calyx lobes; stamens pseudomonadelphous, the alternating anthers reduced and sterile; ovary linear, pubescent, the style incurved, glabrous, the stigma capitate. *Legume* linear, mostly straight, sometimes compressed, with a small but prominent often upturned beak, mostly pubescent, explosively dehiscent by 2 valves; seeds numerous, separated by valvular tissue, plump, lenticular.

Teramnus is distinguished by its small flowers with subulate-toothed calyx and glabrous standard. The anthers, only 5 fertile, are also distinctive. The genus

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includes about 8 species of both Old and New World tropics. Only three species are known in the Neotropics, all three of which occur in Panama. These are mainly plants of recent disturbance, although they may persist as weeds around gardens.

Teramnus rhombifolius Beurling, Kongl. Vetensk. Acad. Nya Handl. 1854: 120. 1855, was described from a collection taken near Portobelo by Billberg. This collection has not been located, and the species cannot be determined from the original description. It may be synonymous with either *T. uncinatus* or *T. labialis*.

a. Leaflets densely sericeous beneath; fruits densely long villous, the beak more than 2.5 mm long ---------- 2. *T. uncinatus*
aa. Leaflets sparsely pubescent beneath, sometimes appressed pubescent; fruits with thin, short pubescence, the beak mostly less than 2.5 mm long.
  b. Leaflets mostly ovate, only 1.5 times longer than wide; calyx wide 5 subequal teeth ---------- 1. *T. labialis*
  bb. Leaflets mostly narrow, 2 or more times longer than wide; calyx with the longer upper pair of teeth fused to near the top or higher ---------- 3. *T. volubilis*

1. **Teramnus labialis** (L.f.) Spreng., Syst. Veg. 3: 235. 1826.

Glycine labialis L.f., Suppl. Pl. 325. 1781. LECTOTYPE: East Indies, herb Linn (LINN 901.15, not seen; microfiche MO).

Twining *vines* climbing on herbs and shrubs, the stems hispid, glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate, apically acute or obtuse, mucronate, basally rounded, mostly 2–6 cm long, 1.5–2.5 cm wide, mostly copiously pubescent on both sides, more so beneath, the hairs sometimes appressed; petiolules 1–2 mm long, hispid; stipels subulate, the stipules subulate, sparingly long hispid. *Inflorescences* axillary racemes, mostly short, 2–5(–12) cm long, peduncle slender, retrorsely pilose, glabrescent in fruit; bracteoles ca. 2 mm long, about as long as the calyx tube. *Flowers* inconspicuous, white or pinkish; calyx tubular, ascending hispid, the tube ca. 2 mm long, the teeth subequal, about equalling the tube, the standard exserted about 1 mm from the calyx teeth. *Legume* linear, somewhat compressed, 3–5 cm long, mostly 5–6 mm wide, sericeous; seeds tan with dark mottling, plump lenticular, 4 mm long.

This species is similar vegetatively to *Teramnus volubilis*, but the leaves are usually smaller and broader. The calyx is different.

Teramnus labialis is widespread in the Caribbean region, and it is naturalized in the Old World. It appears to be uncommon in Panama.

CANAL ZONE: Albrook site, U.S. Army Tropic Test Center, *Dwyer 7118* (GH). CHIRIQUÍ: Near Cuesta de Piedras, 730 m, *Burt & Koster 161* (SCZ). LOS SANTOS: Monagre Beach 5 mi SE of Chitré, *Tyson et al. 3009* (SCZ).

2. **Teramnus uncinatus** (L.) Swartz, Nov. Gen. Sp. Pl. 105. 1788.—FIG. 49.

Dolichos uncinatus L., Sp. Pl., ed. 2. 1019. 1763. TYPE: not seen.
Calopogonium phaeophlebium Donnell Smith, Bot. Gaz. 52: 46. 1911. TYPE: Mexico, *Heyde & Lux 3742*, not seen.

Long twining *vines*, mostly on shrubs and herbs; stems brownish to greyish sericeous with elongate and shorter hairs, the shorter hairs reflexed, glabrescent.

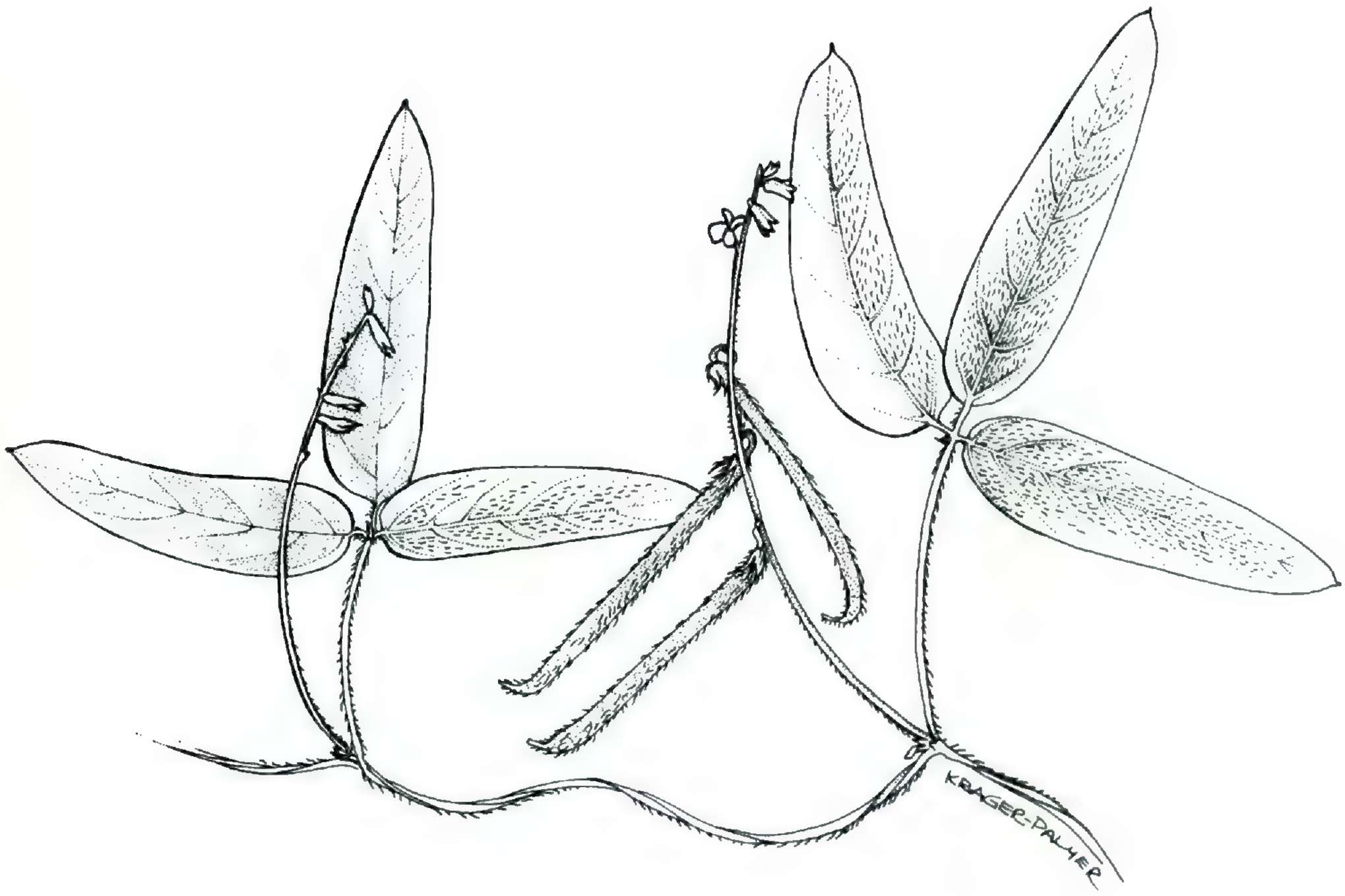

FIGURE 49. *Teramnus uncinatus* (L.) Sw. Habit (×3/5). [After *Nee 9490*.]

Leaves pinnate trifoliolate; leaflets ovate, mostly 4–8 mm long, 1.5–3.5 mm wide, the lateral leaflets slightly smaller, apically obtuse, mucronulate, basally obtuse, discolorous, sparingly sericeous above, densely so beneath; petiolules ca. 2 mm long, tomentose; rachis mostly 3–5 mm long, petiole mostly 2–3 cm long; stipels subulate, about as long as the petiolules; stipules narrow, sericeous, ca. 2 mm long. *Inflorescences* weak axillary racemes, to 15 cm long; peduncle pilose; bracteoles 1–2 mm long, subtending the calyx; bracts 1–2 mm long, narrow; pedicels 1–2 mm long, relatively stout, mostly well spaced. *Flowers* small, inconspicuous, purplish or whitish; calyx sericeous, tubular, the tube ca. 2 mm long, the 5 teeth subulate, subequal, ca. 2 mm long, enclosing most of the corolla; standard obovate. *Legume* linear, straight or slightly curved, somewhat compressed, 4–7 cm long, partitioned between the seeds sericeous to hispid 2–4 mm wide, the beak 2–3 mm long, abruptly upturned; seeds ca. 3 mm long, reddish brown, plump, rectangular, lustrous.

This species may be recognized by its copious pubescence, the leaves being densely sericeous beneath. The flowers are similar to those of *T. labialis* but the foliage of the two species is quite different.

Teramnus uncinatus ranges through the Neotropics, and it is common in recent disturbance. In Panama it occurs mainly in the lowlands.

CANAL ZONE: Barro Colorado Island: *Croat 13151* (MO, SCZ). Near Fort Clayton, *Greenman & Greenman 5184* (MO). La Boca, *Mori & Kallunki 3681* (MO). ½ mi W of Summit Garden, *Nee 9490* (MO). Ancón, *Piper 5162* (NY, US). Empire to Mandinga, *Piper 5772* (US). Ancón Hill, *Standley 26324* (US). Sosa Hill, Balboa, *Standley 26412* (US). Gamboa, *Standley 28338* (MO, US). Old Las

Cruces trail between Fort Clayton and Corozal, *Standley 29074* (US). Summit, *Standley 30119* (US). Darién Station, *Standley 31574* (US). Obispo, *Standley 31767* (US). Balboa, *Standley 32122* (US). CHIRIQUÍ: David-Concepción, *Burt & Koster 139* (MO). Quebrada Guanabano, 0–100 m, *Croat 22508* (MO). From Boquete to 3 mi N, 3300–4200 ft, *Lewis et al. 373* (GH, MO, US). El Almendro, *Lezcano 34* (O, PMA). Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 23* (MO). COCLÉ: 10 mi E of Natá at Río Grande, *Tyson 5240* (FSU, MO, PMA, SCZ). COLÓN: Near Salamanca, 8 mi E of Transisthmian Highway, 100 m, *Gentry 6717* (MO). Sardinilla, *Taylor 40* (PMA), *45, 46* (both MO, PMA). Camino a Palmas Bellas Mata, *Taylor 56, 62* (both PMA). Sardinilla, *Taylor 80* (PMA). DARIÉN: Santa Fé, *Duke 9495* (NY). HERRERA: 4 mi S of Los Pozos, *Tyson 2689* (FSU, MO, SCZ). LOS SANTOS: Las Tablas-Chitré, 0–100 m, *Burt & Rattray 62* (MO). 12 mi S of Macaracas, *Tyson et al. 3066* (MO, SCZ). PANAMÁ: Calzada Larga, *Carrasco 43* (F, MO, PMA). Chilibre, *Dwyer 11975* (MO, US). Juan Díaz, *Lara 41* (F, MO, PMA). Tumba Muerto road, near Panamá, *Standley 29799* (US). Road to Cerro Azul ca. 1 mi from Chepo road, *Wilbur 24104* (DUKE). VERAGUAS: Divisa-Santiago, 0–100 m, *Burt & Rattray 70* (MO).

3. **Teramnus volubilis** Swartz, Nov. Gen. Sp. Pl. 105. 1788. TYPE: Jamaica, *Swartz*, not seen.

Slender twining *vine*; stems retrorsely pilose. *Leaves* pinnately trifoliolate, leaflets narrowly ovate or oblong, mostly 2.5–5 cm long, 0.5–1.5 cm wide, apically obtuse, mucronate, basally rounded, glabrate above, mostly appressed pubescent beneath; petiolules ca. 1 mm long, ascending pilose; stipels acicular, about as long as the petiolules; stipules ca. 2 mm long. *Inflorescences* several flowered axillary racemes, mostly 5–15 cm long; peduncles slender, pilose; bracteoles ca. 2 mm long, inserted on the pedicel just below the calyx; pedicels slender, ca. 2 mm long, minutely retrorsely pubescent. *Flowers* inconspicuous, white or pale violet; calyx tubular, ascending appressed pubescent, the tube ca. 2 mm long, the teeth about as long as the tube, the upper pair connate to near the top, the lower 3 teeth shorter; standard, emarginate, exserted ca. 1.5 mm from the upper calyx teeth. *Fruit* linear, mostly 1.5–3 cm long, ca. 2 mm wide, coiling and turning black on dehiscence; seeds ellipsoidal to subquadrate, dull olive buff, ca. 2 mm long, the hilum broadly elliptical, lateral on 1 edge.

This species is similar to *Teramnus labialis* but differs in leaf shape, longer pedicels and in the upper calyx teeth being fused for all or most of their length. It is possible that the two species intergrade.

Teramnus volubilis ranges throughout the Caribbean area, but appears to be somewhat rare.

CANAL ZONE: Barro Colorado Island, *Croat 13222* (MO). Near Fort Clayton, *Greenman & Greenman 5184* (MO). CHIRIQUÍ: Monte Verde, 2.5 km W of Puerto Armuelles, 80 m, *Liesner 25* (MO). COLÓN: Camino de Gatún despues de la entrada de Fort Gulick, *Taylor 56* (PMA). DARIÉN: El Real, Rio Tuira, *Stern et al. 756* (MO). PANAMÁ: El Llano, *Gentry 2647* (MO). Without other locality, *Klawe P-13* (US).

45. TRIFOLIUM

W. G. D'Arcy[93]

Trifolium L., Sp. Pl. 764, 1753; Gen. Pl., ed. 5. 337. 1754. TYPE: *T. pratense* L.

Annual or perennial *herbs*. *Leaves* mostly trifoliolate, the leaflets minutely toothed at the apex. *Inflorescences* axillary or pseudo terminal, disposed as

[93] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

heads, umbels or as short racemes on ascending peduncles. *Flowers* small; calyx tubular, glabrous or pubescent, the 5 teeth usually bristle tipped, equal or nearly so; keel petals shorter than the wing petals, some or all of the petals connate and adnate to the staminal sheath; stamens diadelphous, some or all of the filaments apically expanded, the anthers alike; ovary small, few-ovulate, the styles short, curved, glabrous, the stigma minute, capitate. *Fruits* small, mostly enclosed in the calyx, mostly indehiscent, thin; seeds few (or 1).

This genus includes some 300 species of temperate and subtropical regions. Many species are important fodder plants. They are also important sources of honey. "Clover." "Trébol."

a. Upper calyx lobes shorter than the others; petioles pubescent; leaflets mostly less than 10 mm long; inflorescence mostly less than 10 mm across; flowering pedicels less than 2 mm long, the peduncle long hairy ..... *T. dubium*
aa. Upper calyx lobes longer than the others; petioles glabrate; leaflets mostly much more than 10 mm long, inflorescence mostly more than 15 mm across; flowering pedicels more than 3 mm long, the peduncle glabrate ..... *T. repens*

1. **Trifolium dubium** Sibth., Fl. Oxon. 231. 1794. TYPE: not seen.—FIG. 50.

T. filiforme var. *dubium* (Sibth.) Fiori & Paoletti, Flor. Ital. 4: 140. 1907.

Annual *herbs* to 2 dm; stems lightly pilose. *Leaves* pinnately trifoliolate, the leaflets obovate lanceolate, 5–15 mm long, 3–5 mm wide, apically rounded or retuse and dentate, cuneate basally, the secondary veins prominent, diverging from the midvein at about 30°; petioles usually shorter than the leaflets, pilose to glabrate; stipules usually ovate, 3–5 mm long, fused to the petiole along much of its length. *Inflorescences* numerous, compressed racemose, the peduncles pubescent, 15–20 mm long; bracts minute. *Flowers* subsessile, ca. 3.5 mm long; calyx narrow campanulate, 1–2 mm long, the teeth linear, the lowermost tooth the longest, about equal to the tube in length, with few hairs at the apex; corolla white, standard obovate, ca. 3 mm long, minutely serrulate toward the apex, cuneate at the base, the wing petals subcircular, ca. 3 mm long, the lower margin constricted sharply at the base, the auricle uncinate, ca. 0.7 mm long, the claw ca. 1 mm long, the keel petals oblong, ca. 2.5 mm long, shorter than the wing petals; stamens diadelphous, the filaments united for ½ their length; ovary stipitate for ca. 1.5 mm, oblong rotund, 1–4-ovulate, glabrous, the style slightly curved, ca. 0.5 mm long. *Fruits* small, somewhat compressed, usually 1-seeded.

This species is native to Europe and western Asia and is naturalized in North America. Apparently common in Costa Rica, it also occurs in Panama, the West Indies and sporadically in South America. "Little Hop Clover."

CHIRIQUÍ: Cerro Punta, entrada a finca San Román, 1500–2300 m, *Beliz 224* (MO). Bajo Grando, 1–3 km E of town of Cerro Punta, *Nee 10032* (MO). Río Chiriquí Viejo, *G. White 56* (MO). Roadside woods halfway between Cerro Punta and Bambito, 5600 ft, *Wilbur et al. 10900* (MO).

2. **Trifolium repens** L., Sp. Pl. 767. 1753. TYPE: Europe (LINN 930.16, not seen).

Glabrate perennial *herb*, rooting at the nodes. *Leaves* trifoliolate, the leaflets obcordate, 8–15 mm long, 10–20 mm wide, the venation conspicuous, parallel,

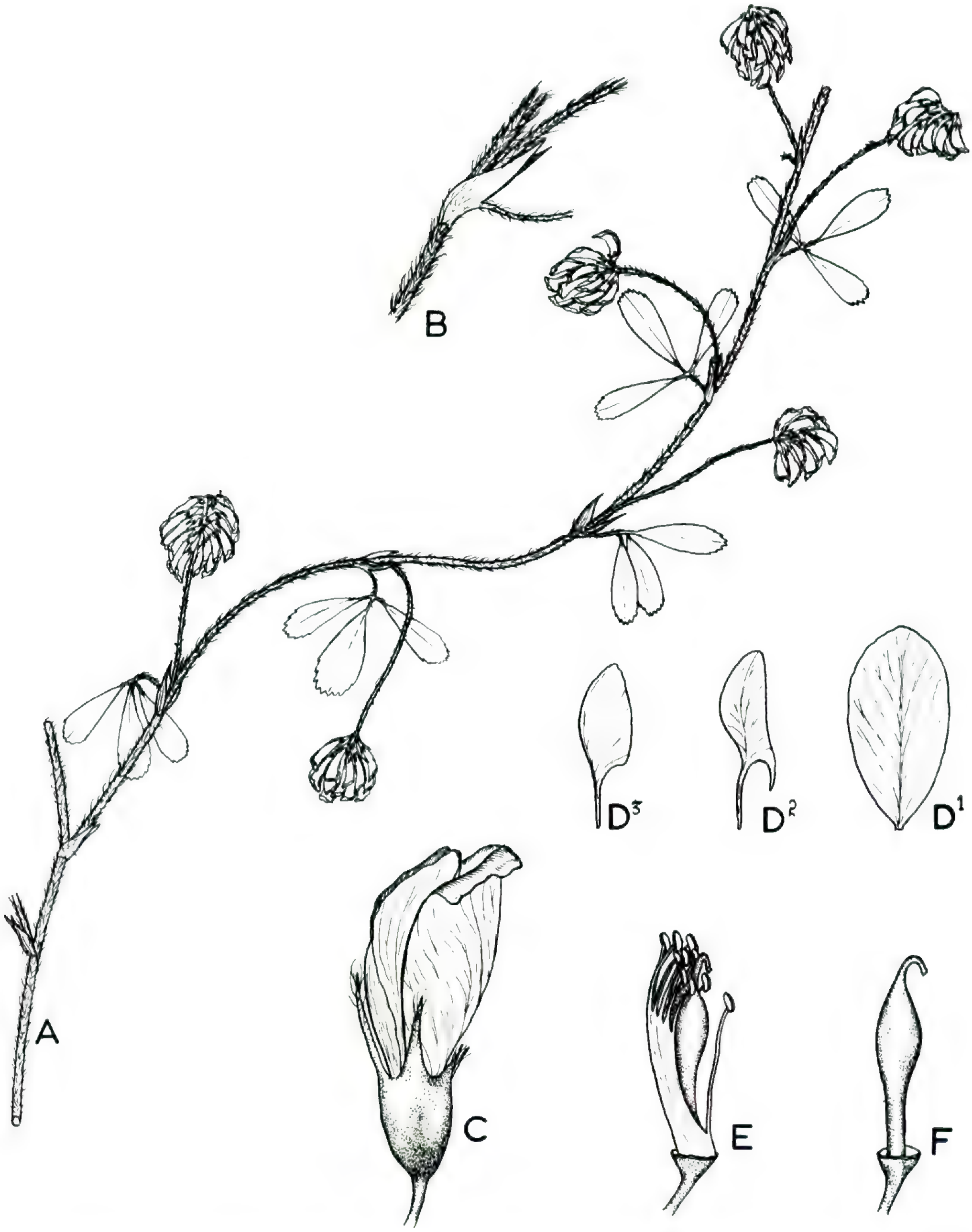

FIGURE 50. *Trifolium dubium* Sibth.—A. Habit (×1^1/$_5$).—B. Stipule (×3^3/$_5$).—C. Flower (×9^3/$_5$).—D. Corolla (×6).—D^1. Standard.—D^2. Wing petal.—D^3. Keel petal.—E. Androecium (×9^3/$_5$).—F. Pistil (×9^3/$_5$). [After *White 56.*]

ascending and produced into conspicuous, small, apical teeth; petiolules short, ca. 1 mm long; petiole elongate, many times longer than the leaflets, glabrate; stipules membranaceous, 10–14 mm long, sheathing the stem, apically caudate. *Inflorescences* axillary, globose heads 15–30 mm across; petiole elongate, to 40 cm long, usually exceeding the peduncles, glabrate; pedicels slender, 3–5 mm

long. *Flowers* fragrant, white (Panama), pink, red or yellow, soon turning brown; calyx glabrous, ca. 10-veined, ca. 5 mm long, the teeth subulate, the uppermost much longer and nearly as long as the tube; corolla exserted 7–8 mm from the calyx tube, the petals more or less smooth (not sulcate), the standard ca. 10 mm long, subentire, the wings with the claw narrowly orbicular, ca. 3.5 mm long, slightly auricled, the keel ca. 7 mm long, slightly shorter than the wings, oblong; stamens diadelphous, the filaments united less than ½ way, mostly expanded just below the anthers; ovary stipitate to about halfway up, glabrous, the style curved in the upper ½. *Fruit* linear, 4-seeded, compressed between the seeds, enclosed in the calyx.

This species is an important fodder plant widely cultivated in Europe. It is also cultivated and naturalized in upland Chiriqui where it may be found along roadsides. "White Clover."

CHIRIQUÍ: Finca Collins near Boquete, *Blum & Dwyer 2533A* (MO). Río Chiriquí Viejo N of Volcan City, 5200–5600 ft, *Duke 9008* (MO). Boquete trail past Cerro Respinga, 200–2500 m, *Gentry 5953* (MO). Bajo Grando, 1–3 km E of town of Cerro Punta, *Nee 10031* (MO). Cerro Punta, *Rojas 15* (MO). Bambito, 5600 ft, *Tyson 5678* (MO).

46. ULEX

W. G. D'Arcy[94]

Ulex L., Sp. Pl. 741. 1753; Gen. Pl., ed. 5. 329. 1754. TYPE: *U. europaeus* L.

Spiny *shrubs*, the spines consisting of sharp pointed shoot axes. *Leaves* mostly alternate, linear, mostly indurate, spine-like (trifoliolate in juveniles). *Inflorescences* solitary in the leaf axils or clustered and paniculate, racemose or umbellate; pedicels surmounted by a pair of bracteoles subtending the flowers. *Flowers* yellow, calyx persistent, 2-lipped to near the base, the upper lip 2-denticulate, the lower lip 3-denticulate; corolla yellow, persistent; stamens monadelphous, the anthers oblong to linear (in the same flower); style slightly curved. *Legume* broad or narrow, pubescent, dehiscent, about as long as the calyx; seeds 1–6.

Literature:

Rothmaler, W. 1941. Revision der Genisteen. 1. Monographien der Gattungen um *Ulex*. Bot. Jahrb. Syst. 72: 69–116.

1. **Ulex europaeus** L., Sp. Pl. 741. 1753. TYPE: Europe, herb. Linnaeus (LINN 915.1, not seen; microfiche MO).—FIG. 51.

Densely branched *shrub* to 2 m tall, eventually becoming a *tree* to 7 m tall, with a well defined, bare trunk; twigs conspicuously sulcate, long pilose, the leaves and flowers borne on short shoots (phyllodes) to 5–10 cm long, each ending in a sturdy, sharp, spine, the tip sclerified. *Leaves* (adult), linear, mostly 5–10 mm long, stiff and sharp pointed, ciliate and sparingly pubescent with short bent hairs, becoming glabrous upwards; stipules wanting. *Inflorescences* epeduncu-

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FIGURE 51. *Ulex europaeus* L.—A. Habit (×⅓).—B. Flower (×2⅔).—C. Corolla (×2).—D. Androecium (×2⅔).—E. Pistil (×2⅔). [After *White 5*.]

late, solitary flowers in the leaf axils, clustered to form a racemose panicle; pedicels 6–8 mm long, tomentose, subtended by a minute tomentose basal bract, surmounted by a pair of tomentose, deltoid or ovate bracteoles, 2–3 mm wide and 3 mm long. *Flowers* showy yellow, the calyx yellow, ca. 12 mm long, 2-lobed to the base, cucullate, the lobes minutely denticulate, spreading pilose overall; corolla yellow, ca. 15 mm long, not much exceeding the calyx, the standard 15 mm long, 11 mm wide, retuse, the wings 15 mm long, basally ciliate, oblique with the costa abaxially pubescent, the keel 11 mm long, oblique, uncinate; stamens monadelphous, the filaments fused to a high level, the anthers oblong to linear (within the same flower) 1–2 mm long; style glabrous, somewhat curved near the apex, the stigma a median crest. *Legume* 12–20 mm long, villous; seeds 3–4, brownish, somewhat trigonous.

This species is native to western Europe where it is planted for fodder and hedges. In Panama it was collected only once, in flower in March 1938. The species is naturalized in upland Costa Rica and many other countries. "Furze," "Gorse" (English), "Tojo," "Hiniesta espinosa" (Spanish).

CHIRIQUÍ: Cerro Pando, near upper Río Chiriquí Viejo, *White 5* (MO).

47. VIGNA

James A. Lackey[95] & W. G. D'Arcy[96]

Vigna Savi, Nuovo Giorn. Lett. 8: 113. 1824. Based on *Dolichos luteolus* Jacq. = *Vigna luteola* (Jacq.) Benth.

Vines or *herbs*, rarely shrubby, mostly with sturdy rootstocks, lacking uncinate hairs. *Leaves* pinnate or subdigitate trifoliolate, rarely 1-foliate, mostly entire; stipels, nervate, mostly blunt; glabrate stipules sometimes produced below the insertion, sometimes bilobate. *Inflorescences* axillary or terminal, pseudoracemes or subcapitate, the rachis contracted, the nodes glandular; bracts and bracteoles caducous; pedicels 1–2 per node, mostly shorter than the calyx. *Flowers* yellowish or white, sometimes with some purple or violet; calyx 2 lipped, the upper lip emarginate, the lowest tooth of the lower lip longest; standard orbicular, auriculate, sometimes appendaged on the dorsal face, the wings about equalling the standard and keel, the keel apically curved up to 1 spiral, often oblique; vexillary stamen free, the anthers uniform; style apically thickened and barbate on the inner face, caducous, sometimes with a curved beak. *Legume* linear to oblong, turgid or compressed, straight or curved, not septate; seeds reniform or quadrate, the hilum short or long, a well developed aril sometimes present.

Vigna embraces about 150 species of tropical regions of both hemispheres. In Panama most species have flowers at least partly yellow, but in other countries some species have violet or purple flowers. A number of species of *Vigna* are important food plants for man, e.g. *V. unguiculata*, and species are sometimes cultivated for cattle fodder.

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Vigna radiata (L.) R. Wilczek was reported (as *V. aureus* Roxb.) by Standley (1928), but no specimens have been seen of this species from Panama. The species is commonly used in Panamanian restaurants for bean sprouts (English) or frijoles nacidos (Spanish), but inquiries amongst Chinese merchants indicate that all such beans are imported and none are grown in Panama. It is likely however, that the species has been cultivated or has grown to maturity from refuse from time to time. *Vigna radiata* is an erect herb which has distinctive, large, 5–15 mm long stipules.

a. Style coiled 3–5 revolutions.
  b. Leaflets linear to narrowly lanceolate ..... 5. *V. linearis*
  bb. Leaflets broadly lanceolate to ovate.
    c. Seeds 8–15; pedicels of mature flowers and fruits 2–6 mm long; calyx teeth lanceolate ..... 1. *V. adenantha*
    cc. Seeds 17 or more; pedicels of mature flowers and fruits 6–13 mm long; calyx teeth broad ..... 2. *V. caracalla*
aa. Style erect or sigmoid.
  d. Inflorescences pseudoracemose.
    e. Leaflets lobed ..... 4. *V. lasiocarpa*
    ee. Leaflets not lobed.
      f. Seeds 7–8; stipules with small lobes below the point of attachment; bracteoles about twice the calyx length ..... 3. *V. juruana*
      ff. Seeds 9–13; stipules not produced below the point of attachment; bracteoles about half the calyx length ..... 8. *V. peduncularis*
  dd. Inflorescence subumbellate.
    g. Seeds 6–9; flowers 10–19 mm long.
      h. Upper calyx lobe partially united ..... 6. *V. longifolia*
      hh. Upper calyx lobe completely united.
        i. Leaflets obovate, apically blunt rounded, or emarginate fleshy ..... 9. *V. retusa*
        ii. Leaflets ovate, apically pointed, not fleshy ..... 7. *V. luteola*
    gg. Seeds 12–20 or more; flowers (15) 20–27 mm long.
      j. Plants with long spreading hairs; pods ca. 4 mm wide ..... 11. *V. vexillata*
      jj. Plants glabrate; pods ca. 8 mm wide ..... 10. *V. unguiculata*

1. **Vigna adenantha** (G. F. Meyer) Maréchal et al., Taxon 27: 202. 1978.

Phaseolus adenanthus G. F. Meyer, Prim. Fl. Esseq. 239. 1818. TYPE: Cultivated, Hamburg [from Guyana], *Meyer* (?GOET, not seen).

Twining *vine*, perennial; stems often stout, glabrous or hirsute with tawny mostly reflexed hairs. *Leaves* pinnate trifoliolate; leaflets slightly thick, ovate, apically acute, basally obtuse or rounded, the major veins prominent, mostly 6–9 cm long, 4–7 cm wide, glabrate or inconspicuously pilose, mostly inconspicuously ciliolate on margins and major veins beneath, sometimes barbulate at the base; petiolules 1–4 mm long, tomentose; petioles often exceeding the terminal leaflet, sparingly pubescent, drying angled, the rachis 2–4 cm long; stipels ovate, glabrous, thin, ca. 1 mm long; stipules 3–5 mm long, acute, striate, glabrate. *Inflorescences* 15–35 cm long, erect, mostly longer than the leaves, the nodes enlarged, mostly clustered at the apex but a few sterile nodes sometimes distributed lower down; peduncle basally stout, narrowing upwards, glabrate; bracteoles ovate, nervate, mostly ca. 4 mm long, but sometimes exceeding the calyx; bracts ovate acuminate; pedicels shorter than the calyx. *Flowers* purplish or pink; calyx open campanulate, ca. 4 mm long, the upper teeth fused into an emarginate lip, the lower teeth about as long as the tube, narrow, standard suborbicular, 1.5–2.5

cm long, the keel forming 3 spirals. *Legume* linear, sometimes curved, 7–12 cm long, 8–10 mm wide, glabrate or pubescent, turgid, beaked; seeds ovoid, 3–5 mm long, brown.

For a lengthy list of synonyms see Maréchal et al. 1978. Only this name has been used for Panamanian plants.

BOCAS DEL TORO: Changuinola to 5 mi S at junction of Río Terebe, 100–200 ft, *Lewis et al. 931* (MO). Chiriquí Lagoon, *Wedel 1068, 1242* (both MO, US). Water Valley, *Wedel 1515* (MO, US), *2751* (GH, MO, US). CANAL ZONE: Chagres, *Fendler 71* (MO). Ancón Hill, *Greenman & Greenman 5085* (MO). Near Bohio, 10–20 m, *Maxon 4771* (US). Frijoles, *Pittier 2691* (US). Grounds of Fort San Lorenzo, *Porter et al. 5000* (MO). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29215* (US). Summit, *Standley 30116* (US). Curundú, *Tyson & Lazor 7147* (PMA). CHIRIQUÍ: Las Lajas, *Burt & Koster 163* (MO). Near Río Fonseca, *Burt & Koster 169* (MO). Quebrada Melliza 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 509* (F, MO). COCLÉ: Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 540* (MO). Panamerican Highway at Río Chico bridge ½ mi S of Natá, *Nee 10774* (MO). Penonomé, 50–1000 ft, *Williams 393* (US). DARIÉN: Puerto Indio (Sambú), *Hammel 1104* (MO). Sambú River, *Pittier 5532* (US). HERRERA: Near Cupampa, 0–100 m, *Burt & Koster 85A* (MO). Ocú, *Stern et al. 1748* (MO). Las Minas, *Stern et al. 1799* (MO). LOS SANTOS: 5 mi S of Pocrí, *D'Arcy & Croat 4208B* (MO). PANAMÁ: Panamá Viejo, 5–10 m, *Dodge* 18 Jan. 1935 (MO); *Dwyer 2178* (MO). Vera Cruz, *Lewis et al. 2992* (DUKE, MO). Savanas, *Macbride 2661* (US). Tumba Muerto Road near Panamá, *Standley 29801* (US). Juan Díaz, *Standley 30499* (US). Between Matías Hernández and Juan Díaz, *Standley 31968* (US). La Capitana, *Taylor 25* (PMA). 2 km entrada camino Cerro Azul, Galera Barleta, *Taylor 95* (PMA).

2. **Vigna caracalla** (L.) Verdc.,[97] Kew Bull. 24: 552. 1970.

Phaseolus caracalla L., Sp. Pl. 725. 1753. TYPE: ?India, not located.

Twining *vine*, sometimes somewhat woody below; stems sparsely appressed pubescent, glabrescent. *Leaves* pinnate trifoliolate; leaflets ovate, mostly 8–15 cm long, 4–9 cm wide, apically short acuminate, basally obtuse, truncate or rounded, glabrate; petiolules stout, 3–6 mm long, tomentose; petioles stout, drying angled, about as long as the terminal leaflet; stipels ovate, glabrous, striate, 2–4 mm long; stipules deltoid, striate, ciliate. *Inflorescences* 5–30 cm long, the enlarged nodes, distributed along the upper portion of the peduncle; bracteoles ovate, striate, 2–2.5 mm long; bracts ovate, striate, caducous; pedicels slender, expanded below, to 9 mm long, glabrous. *Flowers* pale lavender or purple, sometimes partly white; calyx broadly campanulate, basally cupular, to 13 mm long, the lobes short, rounded; standard to 5 mm long, curled back, the keel in 4 spirals. *Legume* linear oblong, falcate, compressed, slightly turgid around the seeds, 8–15 cm long, ca. 1 cm wide, maturing buff colored, minutely pilose; seeds compressed globose, ca. 8 mm across, black, the hilum white, conspicuous.

BOCAS DEL TORO: Water Valley, *Wedel 1473* (MO). CANAL ZONE: Near Salamanca Hydrographic Station on gorge of Río Pequení, *Dodge et al. 17066* (MO).

3. **Vigna juruana** (Harms) Verdc., Kew Bull. 24: 540. 1970.

Phaseolus campestris sensu Benth. in Mart., Fl. Bras. 15(1): 189. 1859, non Benth. 1837 (=*Macroptilium longepedunculatum* (Benth.) Urban).

Phaseolus juruanus Harms, Notizbl. Königl. Bot. Gart. Berlin 7: 506. 1921. TYPE: Brazil, *Ule 5533* (B, holotype, if extant; isotype K, not seen).

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[97] For a list of synonyms see Piper, 1926. Only these names have been used for Panamanian plants.

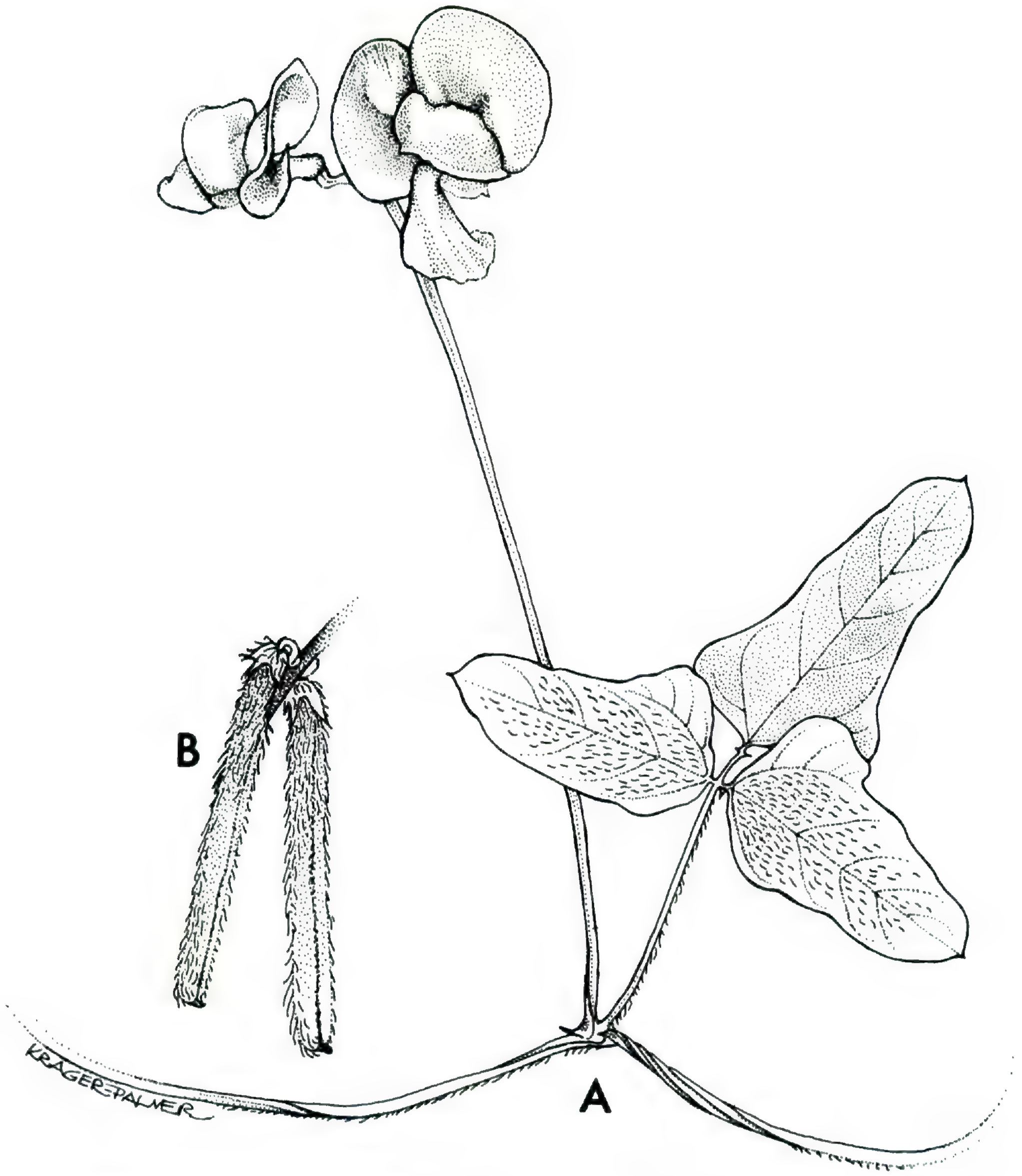

FIGURE 52. *Vigna lasiocarpa* (Benth.) Verdc.—A. Habit (×⅔). [After *Allen 1059.*]—B. Fruit (×⅔). [After *Dwyer 3558.*]

Slender *vine*, stems with long, sparse sturdy tawny hairs. *Leaves* pinnate trifoliolate, the leaflets ovate, mostly 4–10 cm long, 3–6 cm wide, apically acuminate, basally rounded or obtuse, thin, drying concolorous, with inconspicuous, scattered hairs on both sides, petiolules 3–4 mm long, drying angled, hispidulous; petioles often exceeding the terminal leaflets; stipels ovate, 1–2 mm long, glabrous, glandular; stipules linear lanceolate, 3–5 mm long, ciliate. *Inflorescences* 5–20 cm long, axillary; peduncle terete, retrorsely hispidulous pilose with tawny hairs, the rachis tomentose with whitish, somewhat curly hairs, ca. 2 mm long, the nodes prominent; bracteoles and bracts linear ascending pilose, ca. 4 mm

long, deciduous; pedicels ca. 1 mm long, ca. 2 per node. *Flowers* yellow, the calyx cupular, 2–3 mm long, the 5 teeth obtuse deltoid, sparingly ascending pubescent; standard orbicular ca. 1 cm long, the keel spiralled. *Legume* linear, turgid, 3–4 cm long, 4–6 mm across maturing black, ascending pilose with tawny hairs; seeds subglobose, shiny, 3–4 mm long.

This species is wide ranging and is reportedly common in South America and Africa. It is known in Panama by only one collection taken in Central Panama about halfway across the Canal.

Vigna juruana is similar to *V. longifolia,* but it differs in having smaller flowers and fruits, in being much less pubescent, especially on the stems, and in having ovate instead of narrow leaflets.

CANAL ZONE: Gamboa, *Tyson 4584* (FSU, SCZ).

4. **Vigna lasiocarpa** (Benth.) Verdc., Kew Bull. 24: 539. 1970.—FIG. 52.

Phaseolus pilosus H.B.K., Nov. Gen. Sp. Pl. 6: 453: 1823. TYPE: not *Vigna pilosa* Baker (1874).
P. hirsutus Benth., Comm. Legum. Gen. 76. 1837. SYNTYPES: Brazil, *Martius, Poeppig,* neither seen. not *Vigna hirsuta* Feay (1872).
P. lasiocarpus Benth., Comm. Legum. Gen. 76. 1837. SYNTYPES: Brazil, *Sieber, Martius,* neither seen.

Sturdy herbaceous *vine*; stems tomentose with yellowish spreading hairs. *Leaves* ovate, often shallowly trilobate, apically obtuse or rounded, mucronate, basally obtuse or rounded, mostly densely whitish tomentulose, more so beneath; petiolules tomentose; petiole and rachis pilose, the rachis short; petiole mostly shorter than the leaflets; stipels 1–2 mm long, elliptical or spatulate, ciliate but otherwise glabrate; stipules subulate, 4–6 mm long. *Inflorescences* few flowered congested pseudoracemes; peduncles mostly 12–30 cm long, slender, tomentulose; bracteoles 2, 6–8 mm long, subtending the calyx, subulate, caducous; bracts deltoid, ca. 2 mm long; pedicels stout, densely sericeous, 4–5 cm long. *Flowers* yellow, the calyx sericeous, campanulate, 6–9 mm long, the teeth slightly shorter than the tube; standard deeply emarginate, 1.5–3 cm long, the keel spiralled. *Legume* linear, 5–8 cm long, 5–8 mm wide, maturing black, pilose with subappressed tawny hairs, scarcely compressed between the seeds; seeds nearly black, shiny, 3–4 mm long, compressed subglobose, the hilum elevated and surrounded by an aril.

CHIRIQUÍ: Las Lajas near beach, *Burt & Koster 162* (MO). Río Fonseca, *Koster 113* (MO). David airport, 25 ft, *Lewis et al. 769* (MO). COCLÉ: Between Aguadulce and Antón, 15–50 m, *Woodson et al. 1217* (GH, MO). DARIÉN: Isla Pedro Gonzales, *Duke 10400* (MO). LOS SANTOS: Las Tablas-Pedasí, 0–100 m, *Burt & Rattray 59* (MO). Between Tonosí and Macaracas, *Oliver et al. 3538* (MO). PANAMÁ: Wet ditch in sugar plantation just NE of Tocumen, *D'Arcy 13431* (K, MO, SCZ). Tocumen Airport, *Dwyer 2882* (MO). Swamp between Río Jagua and El Condor Hill, *Hunter & Allen 470* (GH, MO). El Capitano 4 mi E of Chepo, *Tyson 5352* (MO, FSU, DUKE). VERAGUAS: Hills W of Soná, *Allen 1059* (MO, US).

5. **Vigna linearis** (H.B.K.) Maréchal et al., Taxon 27: 202. 1978.

Phaseolus linearis H.B.K., Nov. Gen. Sp. Pl. 6: 443. 1823. TYPE:
P. elongata Rose, Contr. U.S. Natl. Herb. 8: 311. 1905. SYNTYPES: Mexico, *Nelson 2692, 2848* (?US, neither seen).

Ascending or scandent perennial *herb* or *vine*; stems wiry, retrorsely tawny strigose, glabrescent, often reclining; roots fleshy. *Leaves* pinnate trifoliolate; leaflets linear oblong, mostly 3–5 cm long, 4–7 mm wide, but sometimes wider and slightly 3-lobate, apically obtuse, rounded or minutely retuse, basally truncate, coriaceous, minutely ciliolate on the margins and the lower costa, sometimes with a few coarse hairs at the very base, otherwise glabrous, the costa prominent, elevated beneath, the minor venation prominent arising at right angles to the costa, the major lateral veins anastomosing to form a crenate submarginal vein; petiolules ca. 1 mm long, tawny strigose; petioles slender, glabrate, the rachis short, to 5 mm long; stipels ovate, striate, glabrate, 1–2 mm long; stipules ovate lanceolate, striate, tawny ciliate, ca. 4 mm long. *Inflorescences* few flowered; peduncle slender, 10–15 cm long, glabrate or pubescent with short, appressed tawny hairs; nodes enlarged, mostly near the apex; bracteoles linear lanceolate, glabrate, striate, slightly shorter than the calyx; bracts ovate, striate, glabrous, about as long as the bracteoles; pedicels ca. 2 mm long. *Flowers* red purple; calyx open campanulate, the tube 3–4 mm long, glabrate, the upper teeth deltoid, short, the lower 3 teeth linear, longer than the tube, pubescent; standard 2.5 cm long, the keel forming a spiral (Standley & Steyermark). *Legume* linear, flat, 6–9 cm long, 5 mm wide, glabrous.

This species is quite similar to *Macroptilium gracile* but differs in the lower calyx teeth being narrow, puberulent and longer than the tube, and in having wider and mucronulate rather than pointed leaves.

Vigna linearis ranges from Mexico through Central America and South America to Paraguay. It grows mainly in open rocky or savannah areas. In Panama it has been collected only in savannah area of pronounced dry season.

COCLÉ: Penonomé, 50–1000 ft, *Williams 603* (NY). PANAMÁ: Cerro Campana, 2000 ft, *Clewell 3021* (SCZ). Burned over area SW of Chepo, *D'Arcy 5185* (MO, SCZ). Taboga Island, *Miller 2040* (US). Between Matías Hernández and Juan Díaz, *Standley 32065* (US).

6. **Vigna longifolia** (Benth.) Verdc., Kew Bull. 24: 541. 1970.

Phaseolus longifolius Benth., Comm. Legum. Gen. 75. 1837. TYPE: Brazil, *Schott*, not seen.
P. ovatus Benth., Comm. Legum. Gen. 75. 1837. SYNTYPES: Brazil, *Martius*, *Schott*, neither seen.
P. schottii Benth., Comm. Legum. Gen. 75. 1837. TYPE: Brazil, *Schott*, not seen.
P. trichocarpus C. Wright, Anales Acad. Ci. Méd. Habana 5: 337. 1868. TYPE: Cuba, *Wright 2341* (MO, isotype).

Slender twining *vine*; stems pilose with long weak yellowish hairs, drying grooved. *Leaves* pinnate trifoliolate; leaflets narrowly ovate to oblong lanceolate, mostly 5–8 cm long, 1–3 cm wide, apically acute or slightly and gradually acuminate, mucronate, basally rounded, glabrate but mostly ciliolate on the margins and costa; petiolules ca. 2 mm long, densely pilose; petioles shorter than the leaves, drying angled, pilose as the stems; stipels ovate, glabrous, ca. 2 mm long; stipules acute, ca. 6 mm long, produced ca. 3 mm below the point of insertion, ciliate. *Inflorescences* contracted pseudoracemes on elongate, erect axillary peduncles, peduncles 3–20 cm long, sparingly long pilose, drying angled; bracteoles and bracts subulate, caducous; pedicels shorter than the calyx in flower, somewhat longer in fruit. *Flowers* yellow; calyx campanulate, sparingly pilose with white hairs, 3–4 mm long, the lobes rounded; standard deeply emarginate, the

keel apically recurved and bent to one side. *Pod* oblong, compressed, 3–4 cm long, 7–8 mm wide, maturing black with shaggy tawny hairs, non septate; seeds compressed globose, 3–4 mm long, shiny black with a white hilum.

CANAL ZONE: BARRO COLORADO ISLAND: *Aviles 56* (MO); *Bailey & Bailey 299* (F); *Bangham 506* (A, F); *Croat 5717, 8250* (both MO), *13238* (MO, NY); *Foster 1219* (DUKE); *Shattuck 245* (GH, MO), *909* (MO); *Starry 257* (MO): *Wetmore & Abbe 190* (GH, MO); *Woodworth & Vestal 473* (GH), *535* (F, GH), *564* (F, GH). Juan Mina, *Bartlett & Lasser 16497* (MO). Gatún Lake, *Duke 8308* (NY). Frijoles, *Ebinger 975* (MO). Gamboa, *Tyson et al. 4583* (MO, SCZ). CHIRIQUÍ: David airport, 25 ft, *Lewis et al. 771* (MO). DARIÉN: Río Pirre, *Duke & Bristan 8308* (MO). PANAMÁ: Road to Areriosa from Espina, *Folsom 3452* (MO). Arenoso, lower Río Trinidad, *Seibert 632* (F, MO, NY).

7. **Vigna luteola** (Jacq.) Benth.[98]—FIG. 53.

Dolichos repens L., Syst. Nat., ed. 10. 1163. 1759. Based on *Dolichos maritimus minor,* P. Br.
Dolichos 5. Maritimus, minor P. Br., Civ. Nat. Hist. Jam. 1756.
Phaseolus marinus Burm. in Rumph., Index Alt. Herb. Amboin. 18. 1769. [not seen]. Based on Rumph. Index Alt. Herb. Amboin. 5: 391, *tab. 141, fig. 2,* 1750.
Dolichos luteolus Jacq., Hort. Bot. Vindob. 1: 39, *tab. 90.* 1770 [1771]. TYPE: Amer. Trop., *Jacquin,* Herb. Linnaeus (LINN 900.4, not seen; microfiche MO).
D. luteus Swartz, Prodr. Veg. Ind. Occ. 105. 1788. TYPE: Jamaica, *Swartz,* not seen. (fide Maréchal et al. 1978; Backer, Fl. Java 1: 642. 1963.)
(*Vigna glabra* Savi, Bull. Sci. Nat. Géol. 6: 62. 1825. Renaming of *Dolichos luteolus* Jacq.). 293, no. 5.
Phaseolus maritimus Hassk., N. Schlüss. Rumph., Index Alt. Herb. Amboin. 278. 1864.
Vigna repens (L.) Kuntze, Rev. Gen. Pl. 212. 1891, non Baker 1876.
Phaseolus luteolus (Jacq.) Gegnep, in Lecomte, Fl. Gen. Ind. 2: 229. 1916.
Vigna marina (Burm.) Merrill, Interpret. Rumph., Index Alt. Herb. Amboin. 285. 1917.

Large scrambling and twining *vine*; stems tough, glabrous or hirsute, drying sulcate. *Leaves* pinnate trifoliolate; leaflets ovate, apically acute or obtuse, mucronate; basally obtuse, mostly 3–6 cm long, 1–3 cm wide, the costa and proximal portion of the 2 basal lateral veins prominent, other venation inconspicuous, glabrous or somewhat pilose, drying concolorous; petiolules 1–2 mm long, glabrate; petioles slender, drying angled, glabrate, or somewhat pubescent above, shorter than the terminal leaflet; stipels ovate, ca. 1 mm long, glabrous, not striate. *Inflorescences* to 20 cm long, peduncle narrowing upwards, glabrate; bracteoles and bracts ovate, ca. 1 mm long, membranaceous and costate, ciliolate to erose; pedicels to 5 mm long, pubescent upwards, condensed at the apex of the peduncle. *Flowers* yellow; campanulate, the tube 3–6 mm long, glabrous, the teeth ciliate, shorter than the tube, the upper pair united, the others acuminate, the lowermost tooth narrow, slightly longer, glandular; standard 1.5 cm long, emarginate, the keel apically expanded and bent. *Legume* linear, 4–7 cm long, 5–8 mm wide, turgid, pubescent, maturing black; seeds ovoid, dark, 5–6 mm long, the hilum invaginated, white.

This species is distinct in its small ovate leaflets and in its minute, costate bracts and bracteoles, and in Panama in being glabrate overall.

Vigna luteola is the name traditionally used for this species, and *V. repens* is the only other name which has been used for the species in the New World in recent times. However, it is likely that the plant should be correctly called *Vigna*

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[98] For further synonyms see Maréchal et al., 1978. Only these names have been used for Panamanian plants.

FIGURE 53. *Vigna luteola* (Jacq.) Benth.—A. Habit (×½). [After *Wedel 2718.*]—B. Flower (×1½).—C. Stamens (×2).—D. Pistil (×2). [After *Duke 4340.*]—E. Fruit (×½). [After *Johnston 757.*]

marina (Burm.) Merrill which is based on *Phaseolus marinus* Burman. The figure on which this name is based appears to represent the species discussed here, and as the name was published a year earlier than the Jacquin name employed here, it would appear to be a later synonym of Jacquin's name. Adams, Flr. Pl. Jamaica 1972, recognizes only *V. luteola,* and makes no mention of *Dolichos luteus* which

is based on a Jamaican plant. However, Maréchal et al. and others have interpreted the Burman plate to represent the species treated here as *Vigna retusa* (E. Mey.) Walp., so until a consensus is formed on this point, we are using the traditional, if incorrect, name *V. luteola*.

BOCAS DEL TORO: Santa Catalina, *Blackwell 2701* (MO), *2716* (MO). Runway at Bocas, *Lazor et al. 2372* (MO, SCZ, FSU). Lower Changuinola River, *Stork 137* (US). Chiriquí Lagoon, *Wedel 1170* (GH, MO), *1371* (GH, MO, US). Water Valley, *Wedel 1740* (GH, MO, US). Old Bank Island, *Wedel 1873* (GH, MO, NY, US), *2008* (GH, MO, US). Sheperd Island, *Wedel 2718* (GH, MO). Isla Colón, *Wedel 2831* (GH, NY, US). CANAL ZONE: Just E of Gatún locks, *Duke 4339* (MO). Toro Point, Fort Sherman, *Duke 4340* (MO). Chagres, *Fendler 68* (GH, MO). Cristobal, *Greenman & Greenman 5214* (MO). Fort Sherman, *Standley 31178* (US); *Tyson 2254* (MO, FSU, SCZ), *3522* (MO, SCZ, FSU). Gamboa, *Tyson et al. 4584* (MO). CHIRIQUÍ: Boquete, 1200–1500 m, *Woodson & Schery 736* (GH, MO, US). COLÓN: Río Piedras, road to Portobelo, *Blum et al. 2527* (FSU, MO, SCZ). Miguel de la Borda, *Croat 9838* (MO). María Chiquita, *Croat 11370* (MO); *Dwyer & Kirkbride 7813* (GH, MO, US); *Ebinger 454* (MO, GH). Mouth of Río Piedras, *Lewis et al. 3168* (MO, DUKE). Colón, *Macbride & Featherstone 7* (F, GH, US). Porvenir, *Montgomery 205* (MO). Colón, *Rose 22069* (GH, US). PANAMÁ: Without other locality, *Hayes* (GH). Manzanillo Island, *Hayes 700* (NY). San Jose Island, *Johnston 757* (MO). SAN BLAS: Narganá, *Croat 16852* (MO). Puerto Obaldía, *Croat 16871* (MO). Shoreline opposite Ailigandí, *D'Arcy & Hammel 12211* (MO). Isla Mosquito, *Duke 8855* (MO, US). Soskatupu, *Elias 1694* (MO). Isla Pino near Mulatupo, *Elias 1712* (MO).

8. **Vigna peduncularis** (H.B.K.) Fawc. & Rendle,[98] Fl. Jamaica 4: 68. 1930.

Phaseolus peduncularis H.B.K., Nov. Gen. Sp. Pl. 6: 447. 1823. TYPE: Colombia, not seen.
P. pascuorum Benth., Ann. Wiener Mus. Naturgesch. 2: 137. 1838. TYPE: Brazil, *Martius*, not seen.

Slender twining *vine*, stems glabrate, drying angled or furrowed. *Leaves* pinnate trifoliolate; leaflets rhombic or deltoid, often broad, mostly 5–7 cm long, 3–6 cm wide, apically acute or slightly acuminate, mucronulate, basally obtuse or rounded, the lateral leaflets oblique, the terminal leaflet slightly larger, membranaceous, glabrate or sparingly pilose, often ciliolate and with a small tuft at the base; petiolules 2–5 mm long, pilose dorsally; petiole often longer than the terminal leaflet; stipels ca. 2 mm long, spatulate, striate; stipules 4–6 mm long, striate, ellipsoidal. *Inflorescences* elongate axillary pseudoracemes, 20–40 cm long, the flowers evenly disposed near the top of the peduncle; peduncle erect, glabrate, drying striate; rachis puberulent with curled hairs; bracteoles elliptical, ca. 2 mm long, ciliate, otherwise glabrous, caducous; pedicels ca. 2 mm long, glabrate but glaucous with reduced trichomes, angled. *Flowers* lavender and white; calyx open campanulate, ca. 4 mm long, curly pubescent, the lobes rounded; standard suborbicular, ca. 1.5 cm long, the keel basally ciliolate; stem with ascending apical hairs. *Legume* 4–5 cm long, linear, compressed, slightly compressed between the seeds, ca. 3 mm wide, dark brown, glabrous or pilose with short appressed white or brown hairs; seeds mottled brown, shiny, oblong, 3–4 mm long.

BOCAS DEL TORO: RR station at Milla 7.5, *Croat & Porter 16387* (MO). Changuinola Valley, *Dunlap 48* (F). Isla Potrero, Changuinola Valley, *Dunlap 346* (F, US). Changuinola, *Dwyer 4466* (MO). Hillside above Almirante, *Gentry 2715* (MO). Western Panama, *Stork 48* (US). Water Valley, *Wedel 589, 756* (both MO). Sheperd Island, *Wedel 2673, 2178* (both MO). Isla Colón, *Wedel 2928* (MO). CANAL ZONE: BARRO COLORADO ISLAND: *Busey & Croat 249* (MO); *Croat 5256* (F, MO, SCZ), *6401, 6671* (both MO), *6794, 7032* (both MO, SCZ), *7727, 9102, 10262* (all MO), *10398* (NY), *11844* (MO, SCZ), *13124, 17036* (both MO); *Kenoyer 382* (US); *Netting* 3/24/34 (MO); *Shattuck 74* (MO, US); *Standley 40857* (US). Fort Sherman, *Blum & Dwyer 2114* (MO, SCZ). Gatún, *Cowell 320* (NY).

NW of Escobal, *Croat 12474* (F, MO, SCZ). Río Indio, 70–100 m, *Dodge & Allen 17369* (MO). Madden Dam, *Dwyer 3046* (MO). Chagres, *Fendler 69* (MO). Between Transisthmian Highway and Madden Dam, *Gentry 6689* (F, MO). Peña Blanca in Gatun Lake, *Hladik 108* (MO). Las Cruces Trail, 75 m, *Hunter & Allen 717* (MO). Summit, *Johansen* May 1924 (US). Boy Scout Road ½ km SW of Madden Dam, 90 m, *Nee & Dwyer 9227* (MO). Old Fort San Lorenzo, *Piper 5961* (US). Las Sabanas, *Pittier 6866* (US). Boy Scout Road, Madden Dam area, *Porter et al. 4008* (MO). Corozal, *Standley 27349* (US). Gamboa, *Standley 28368* (US). Mount Hope Cemetery, *Standley 28851* (US). Near Summit, *Standley 29517* (US). Summit, *Standley 29529* (US). Between France Field and Cativa1, *Standley 30210, 30335* (both US). Summit, *Tyson et al. 2744* (MO, SCZ). COCLÉ: Forest around Limón, 5 hours walk N of Alto Calvario, N of El Copé, 800–1000 m, *Folsom 5811* (MO). Panamerican Highway 178 km W of Panama City, 0–100 m, *Folsom 6888* (MO). COLÓN: Miguel de la Borda, *Croat 9838* (MO). Road to Mosquera from Palmas Bellas, *Mori & Kallunki 1956* (MO). Santa Rita hills, *Smith & Smith 3429* (US). DARIÉN: Río Indio, 70–100 m, *Dodge & Allen 17369* (MO). 1–3 mi SE of Santa Fé on Panamerican Highway, *Duke 4122* (MO). Road from El Real to Pinogana, *Duke 5143* (MO). Ridge ca. 2 mi NW of Yaviza, *Duke 6531* (MO). Agua Fria, 8 mi N of Santa Fé, *Duke 10107* (MO). Near Refugio, 30 m, *Duke 10290* (NY). Above Ailigandí, *Duke & Bristan* 341 (MO, NY). Pablo Othon's pasture [El Real], *Duke & Bristan 289* (MO, NY). Manene, *Kirkbride & Bristan 1606* (MO). Juan Díaz, *Standley 30603* (US). El Real, *Stern et al. 797* (MO). PANAMÁ: Cerro Penon 3 km S of Alcalde Díaz, 350–440 m, *Nee 8881* (MO). Near Matías Hernández, *Standley 28874, 28972* (both US). SAN BLAS: Puerto Obaldía, *Croat 17005* (MO, SCZ). 3–4 hours up Río Mulatupo on foot, *Kirkbride 223* (MO). VERAGUAS: Above Santa Fé, slopes of Cerro Tute, *Gentry 6208* (MO).

9. **Vigna retusa** (Meyer) Walp., Repert. Bot. Syst. 1: 778. 1842.

Scytalis retusa E. Meyer, Comm. Pl. Afr. Austr. 147. 1836. TYPE: South Africa, ?herb. Meyer (?B, if extant, not seen).

Vigna marina (Burm.) Merrill, Interpret. Rumph. Index Alt. Herb. Amboin. 285. 1917. Based on *Phaseolus marinus* Rumphius, Index Alt. Herb. Amboin. 5: 391, *tab. 141, fig. 2*. 1750. TYPE: Molucca Is., not seen.

Twining or scrambling perennial *herb* or *vine*; stems pubescent or glabrate, soon glabrescent, drying terete but minutely striate. *Leaves* pinnate trifoliolate; leaflets obovate, apically rounded or emarginate, basally obtuse, mostly 2.5–7 cm long, 1.5–4 cm wide, the costa and basal lateral veins prominent, ?succulent, glabrous or with a very few small scattered hairs; petiolules glabrous to sericeous, drying somewhat angled, 1–2 mm long; petioles and rachis glabrate, drying angled, or deeply sulcate, mostly glabrous; stipels oblong, rounded, 1 mm long, glabrous, often caducous; stipules acute, ca. 2 mm long, ciliate. *Inflorescences* 4–20 cm long, the peduncle slender, glabrous or sparingly pubescent; bracteoles and the bracts ovate, acute, thin with conspicuous costa, ca. 2 mm long; pedicels clustered at the tip of the peduncle, 2–5 mm long, glabrous or puberulent. *Flowers* yellow; calyx campanulate, the tube ca. 2 mm long, glabrous but apically ciliate, the teeth deltoid, the upper pair connate; standard ca. 1.5 cm long, emarginate; lowermost narrow, slightly longer, ca. 2 mm long. *Legume* linear, turgid, 5–6 cm long, ca. 5 mm across, black after dehiscence; seeds subglobose, 3–4 mm across, the hilum white, ca. 1 mm long.

This species is closely related to *Vigna luteola* from which it may not be specifically distinct. Both species have seaside habitats and similar floral characteristics. *Vigna retusa* differs conspicuously in its obovate rounded leaves. It is a species of the Old World, but specimens resembling Old World material have been seen from Brazil (Bahia) and from Panama.

PANAMÁ: San José Island, *Erlanson 2* (GH, NY, US); *Johnston 757* (GH, US).

10. **Vigna unguiculata** (L.) Walp., Repert. Bot. Syst. 1: 779. 1842.

Dolichos unguiculatus L., Sp. Pl. 725. 1753. TYPE: not seen.
Vigna sinensis (L.) Savi ex Hassk., Cat. Pl. Hort. Bogor 279. 1844.
Dolichos sinensis L., Index Alt. Herb. Amboin. 23. 1754. Based on *Dolichos sinensis* Rumph., Index Alt. Herb. Amboin. 5: 375, *tab. 134*. 1747.

Coarse erect or clambering *herbs* or *vines*; stems glabrous, drying terete or strongly angled. *Leaves* pinnate trifoliolate; leaflets ovate or lanceolate, the lateral leaflets strongly oblique, apically acute, acuminate or obtuse, basally obtuse, truncate or cordate, mostly 5–11 cm long, 1.5–5 cm wide, drying slightly discolorous, glabrous except at the very base; petiolules ca. 3 mm long, pubescent; petiole and the rachis glabrous, drying angled, the petiole mostly exceeding the terminal leaflet; stipels elliptical, rounded, glabrous, the lateral pair 2 mm long, the terminal pair shorter; stipules large, ovate, acuminate, nervate, 7–16 mm long above insertion, produced into 2 oblong auricles to 5 mm long below insertion. *Inflorescence* 7–30 cm long, the few flowers congested at the apex; peduncle glabrous, erect; bracteoles 4–7 mm long, exceeding the calyx tube, glabrous, nervate, cucullate; bracts 2–3 mm long, glabrous, nervate, cucullate; pedicels stout, 1 mm long. *Flowers* various colors; calyx tubular campanulate, glabrous, 6–8 mm long, the upper pair fused, deltoid, the lower teeth acuminate, ca. 2 mm long; standard 1.5–2 cm long. *Legume* linear, straight or curved, slightly compressed, mostly 10–40 cm long, ca. 1 cm wide; seeds of various colors.

This species is distinct in its glabrous stems leaves and foliage, in its large stipules which are produced below the insertion, and in its large bracteoles which are longer than the bracts or the calyx tube. The pods occasionally grow to great length, over 1 m long, but are mostly much shorter.

Vigna unguiculata is a crop plant in Panama, cultivated in the lowlands. It is called "cowpea" (English) or "frijol chiricana" (Spanish).

COLÓN: Trail above Río Indios along Caribbean Sea, *Sullivan 129* (MO). PANAMÁ: Roadside ditch halfway up Cerro Azul, 100–500 m, *D'Arcy 13442* (MO). Colegio courtyard, Panama City, *D'Arcy 13457* (K, MO, SCZ). Cultivated, SE side of Madden Lake near Puente Natural, *Nee & Hansen 14058* (MO, WIS). Cultivated, Cía. Selecta de Alimentos, Vía Bolivar, Panama, *Taylor 117* (F).

11. **Vigna vexillata** (L.) A. Rich.,[99] Hist. Fis. Polit. Nat. Cuba 11: 191. 1845.

Phaseolus vexillatus L., Sp. Pl. 724. 1753. TYPE: Type not seen.

Slender twining *vines*; stems mostly retrorsely pilose with long tawny hairs; roots tuberous. *Leaves* pinnate trifoliolate; leaflets mostly narrowly ovate, mostly 5–9 cm long, 2–3.5 cm wide, apically acute, mucronulate, basally obtuse or rounded, thin, pilose with white hairs, mostly glabrescent but remaining ciliate on the margins and the major veins beneath; petiolules 2–3 mm long, tawny pilose; petioles retrorsely hispid, shorter than the terminal leaflet; stipels subulate or narrowly acuminate, mostly ca. 2 mm long; stipules acute, striate, 4–8 mm long, hispid, auriculate. *Inflorescences* axillary, few flowered, 20–30 cm long; peduncle erect, retrorsely pubescent, the flowers congested at the apex; bracts and brac-

[99] For synonyms see Maréchal et al., 1978. Only this name has been used for Panamanian plants.

teoles caducous; pedicels 1–2 mm long. *Flowers* blue or lavender turning white or yellow; calyx short pubescent, 9–13 mm long, campanulate, the 5 teeth acuminate subulate, about as long as the tube; standard 2–2.5 cm long, the keel incurved. *Legume* linear, 7–10 cm long, ca. 5 mm wide, slightly compressed, maturing black, densely pilose, somewhat glabrescent; seeds oblong, 4–5 mm long, dark, shiny, the hilum white.

BOCAS DEL TORO: Almirante, *Barrus 406* (GH). Between Almirante and Ojo de Agua, 3–6 km W of Almirante, 30–200 m, *Croat 38208* (MO). Changuinola Valley, *Dunlap 255* (US), *277* (F, US), *278* (GH, NY, US). Chiriquicito to 5 mi S along Río Guarumo, *Lewis et al. 2071* (MO). Water Valley, *Wedel 1782A* (MO). Isla Colón, *Wedel 2847* (GH, MO, US). CANAL ZONE: BARRO COLORADO ISLAND: *Croat 5625, 6872* (both MO); *Ebinger 77* (GH, MO). Frijoles, *Croat 9056* (MO, SCZ), *10369* (MO). NW of Escobal, *Croat 12448* (MO). Curundú, *D'Arcy 13429* (MO, SCZ). Vera Cruz, *Duke 6064* (MO, US). West Ft. Kobbe towards Vera Cruz, *Duke & Mussell 6565* (MO). Albrook, *Dwyer 6565* (SCZ). Near Fort Clayton, *Greenman & Greenman 5183* (MO). Gamboa, *Kennedy et al. 2326* (MO). Between Frijoles & Monte Lírio, 30 m, *Killip 12168* (US). Balboa, *Standley 25644, 25576* (both US). Gamboa, *Standley 28450* (US). Río Pedro Miguel, near East Paraiso, *Standley 30040* (US). Miraflores locks area, *Tyson 1598* (FSU, MO). Fort Kobbe road, *Woodson et al. 1414* (GH, MO). CHIRIQUÍ: Corotu, 6 km SW of Puerto Armuelles, *Busey 400* (F, GH, MO). San Bartolo Arriba W of Puerto Armuelles, 125 m, *Croat 26718* (MO). Near Río Fonseca, 0–100 m, *Koster 112* (MO). Puerto Armuelles, *Liesner 24* (MO), *91* (MO, NY). COLÓN: *Cotterman & Klawe p-11* (MO, US). DARIÉN: El Real, *Croat 15444* (MO). Road to Pinogana from El Real, *Croat & Porter 15556* (MO). Pablo Othon's pasture [El Real], *Duke & Bristan 284* (MO). 10 mi S of El Real on Río Pirre, *Duke 5481* (MO). Yaviza, *Stern et al. 144* (MO, US). El Real, *Stern et al. 286* (GH, MO, US); *Tyson et al. 4647* (DUKE, F, FSU, GH, MO, NY, SCZ). PANAMÁ: Corozal road near Panama, *Standley 26871* (US). Entrada esclusa Gatún, *Taylor 59* (MO). First bend of Río Pasiga, *Gentry 2380* (MO).

48. WILLARDIA

Peter S. White[100]

Willardia Rose, Contr. U.S. Natl. Herb. 1: 97. 1891. TYPE: *Coursetia mexicana* S. Wats. = *Willardia mexicana* (S. Wats.) Rose.

Shrubs or small *trees*. *Leaves* alternate, imparipinnate; leaflets entire, petioluled, estipellate; stipules caducous or lacking. *Inflorescences* racemes or panicles in uppermost axils, equalling or exceeding the leaves; bracts small, caducous; flowers usually paired on bracteolate branches of the short, bracteolate pedicels. *Flowers* usually bluish or lilac; hypanthium broadly cup shaped, abruptly contracted into a stipe, shallowly 5-lobed or teeth nearly obsolete; petals 5, about the same length, short clawed, free except the keel petals connate for part of the length, standard orbicular; stamens 10, the vexillary stamen fused with the staminal tube except at its base, the anthers uniform; ovary slender, flat, nearly sessile, ovules several, the style short, incurved, glabrous, the stigma small, capitate. *Fruit* a dehiscent legume, linear to oblong, flat, often resinous or with resin ducts near the margin, continuous within; seeds reniform, flattened.

Willardia is a genus of six species of Mexico and Central America. It is often confused with *Lonchocarpus* when in flower or leaf. However, *Willardia* has dehiscent fruits (sometimes tardily so), fruits often with resin ducts, wing petals free from the keel, and the hypanthium narrowed at the base. *Lonchocarpus* fruits are indehiscent and the legume is often flattened into a wing, lacks resin

[100] Uplands Field Lab., Great Smoky Mts. National Park, Twin Creeks Area, Gatlinburg, Tennessee 37738.

ducts, the wing petals are often adherent to the keel, and the hypanthium does not narrow above the juncture with the pedicel.

Literature:

Hermann, J. 1947. Studies in *Lonchocarpus* and related genera I: A synopsis of *Willardia*. J. Wash. Acad. Sci. 37: 427–430.

a. Fruits 5.5–8.0 cm long; leaflets 1.5–5.0 cm long, 0.7–2.0 cm wide; flowers to 11 mm long ---------- 1. *W. schiedeana*

aa. Fruits to 3.5 cm long; leaflets 1.0–2.5 cm long, 0.5–1.0 cm wide; flowers to 9.5 mm long ---------- 1a. *W. schiedeana* var. *lindsayi*

1. **Willardia schiedeana** (Schlecht.) Hermann, J. Wash. Acad. Sci. 37: 429. 1947.—FIG. 54.

Robinia schiedeana Schlecht., Linnaea 12: 306. 1838. TYPE: Mexico, *Schiede 621* (B, not seen; photo F, MO).

Lonchocarpus schiedeanus (Schlecht.) Harms, Feddes Repert. Spec. Nov. Regni Veg. 17: 324. 1921.

L. salvinii Harms, Feddes Repert. Spec. Nov. Regni Veg. 17: 323. 1921. TYPE: Guatemala, *Salvin* 1873–1874 (B, not seen; photo MO; isotype F; fragment US).

L. calderonii Standley, J. Wash. Acad. Sci. 15: 476. 1925. TYPE: El Salvador, *Calderon 2022* (US).

Small to medium-sized *trees*, branchlets glabrous or with a few hairs, warty with light colored lenticels and rough with raised leaf scars. *Leaves* usually alternate, sometimes nearly opposite, 10–15 cm long; leaflets ca. 11, narrowly elliptic to ovate, retuse, 1.5–5.0 cm long, 0.7–2.0 cm wide, glabrous; rachis grooved above, estipellate; stipules caducous; petiolules prominent, 2–3 mm long, grooved above; petioles 2–3 cm long, glabrous. *Inflorescence* racemose or paniculate, axillary on new wood with or before the leaves, showy, the flowers borne along upper ⅔, as long as or just exceeding the leaves; bracts minute; flowers 2 at a node of the inflorescence; pedicels 2–4 mm long, articulated with the branches which are ca. 3 mm long and 2-bracteolate at the articulation with the stipe of the hypanthium. *Flowers* lavender or blue; petals of equal length, 8.5–11.0 mm long when in bloom, the standard to 11 mm long, appressed hairy on lower outside, sagittate at the clawed base, retuse, the wings free, the keel petals coherent on the lower margin towards the tip; staminal sheath with odd stamen united along its entire length, free at the very base for ca. 1 mm; ovary linear, glabrous, the stigma capitate, only about 2 times the diameter of the style. *Fruit* linear, 5.5–8.0 cm long, ca. 1 cm wide, flat, abruptly contracted into a stipe, glabrous; seeds reniform, compressed.

This species is found from Mexico southward to Panama. It is apparently at least locally frequent in deciduous forests of the Pacific slope. In Panama it is known from lowland Chiriquí.

CHIRIQUÍ: Remedios, 0–150 m, *Allen 3659* (MO, NY, US); *Tyson et al. 4216* (MO).

1a. **Willardia schiedeana** var. **lindsayi** (Standley) Hermann, J. Wash. Acad. Sci. 37: 429. 1947.

Lonchocarpus lindsayi Standley, Publ. Field Mus. Nat. Hist., Bot. Ser. 17: 195. 1937. TYPE: Panama, *Lindsay 446* (F, fragment US).

This variety differs from typical material in the following characters: smaller leaflets (to 2.5 cm long and 1 cm wide), a slightly smaller corolla (not over 9.5 mm long), and shorter fruits (to 3.5 cm long). It is known only from the type locality in lowland central Panama.

CANAL ZONE: Bejuco, *Lindsay 399* (F), *446* (F, fragment US).

49. ZORNIA

Michael O. Dillon[101]

Zornia J. F. Gmelin, Syst. Nat. 2: 1076. 1791. TYPE: *Z. bracteata* Walt. ex J. F. Gmelin.

Myriadenus Desvaux, J. Bot. (Desvaux) 1: 121. 1813. TYPE: *Ornithopus tetraphyllus* L. = *Zornia myriadenia* Benth.

Annual *herbs* or suffruticose perennials to 2 m tall; stems diffusely branched, prostrate and spreading to upright and ascending. *Leaves* digitately 2- or 4-foliolate; leaflets often pellucid-punctate, exstipellate; stipules subfoliaceous, paired, peltate, auriculate, 3- to 11-nerved, often punctate. *Inflorescence* spicate, rarely racemose, terminal or axillary, interrupted to congested, 1- to several-flowered; bracts paired, lateral, stipuliform, 3- to 15-nerved, sometimes punctate, enclosing a sessile flower; bracteoles absent. *Flowers* 5-merous; calyx subhyaline, the tube short, 5-lobed, usually 5- to 10-nerved, ciliate, the 2 upper lobes connate nearly to the apex, the 2 lateral lobes much shorter, the lowest oblong or lanceolate, subequal to the upper lip; corolla yellow, orange yellow, or rarely white, frequently purple striate, the standard suborbicular, clawed, to 17 mm long, the wings obliquely obovate or oblong, shorter than standard, usually clawed and auriculate, the keel incurved, subrostrate, smaller than the wings; stamens 10, monadelphous, the filaments connate into a closed tube, splitting dorsally, persistent, the anthers alternately longer, subbasifixed, and short, versatile; ovary sessile, the ovules 2–several, campylotropous, the style filiform, persistent basally, the stigma minute, terminal. *Fruit* a loment of 2–15 articles, compressed, the upper suture nearly straight, the lower deeply sinuate, articulations glabrous to puberulent or pilose, smooth or echinate, usually reticulate, indehiscent; seeds black or dark brown, orbicular to subreniform, estrophiolate. Chromosomes: $n = 10$.

Zornia is a genus of about 75 species (Mohlenbrock, 1961) from tropical and subtropical regions of the world. More than half its species are found in the Western Hemisphere from the southern United States to central Argentina. Only two species are recognized from Panama.

In Panama, *Zornia* appears to be of little economic importance other than as a weed in cultivated areas. However, in Africa *Zornia diphylla* Pers. is used as fodder primarily for horses (Dalziel, 1937). Dalziel also notes, ". . . is said to form a slight lather with water, and therefore used as a poor man's soap . . ." and ". . . in Nigeria the plant is mixed with butter or shea butter, etc., to rub on the body for feverish chills, etc."

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FIGURE 54. *Willardia schiedeana* (Schlecht.) Hermann.—A. Habit (×7/10).—B. Flower (×2 1/5).—C. Wing petal.

Literature:

Mohlenbrock, R. H. 1961. A monograph of the leguminous genus, *Zornia*. Webbia 16: 1–141.

a. Lower leaflets lanceolate to lance-ovate, to 24 mm long, to 12 mm wide; stipules 5–9-nerved; bracts of inflorescence lanceolate to lance-ovate, to 12 mm long, to 8 mm wide, peltate with auricle attenuate to falcate; fruit usually 5–7-articulate ..... 1. *Z. reticulata*

aa. Lower leaflets ovate to elliptic, rarely lanceolate, to 14 mm long, to 6 mm wide; stipules 3–5-nerved; bracts of inflorescence ovate, to 10 mm long, to 5 mm wide, attached basally or subauriculate; fruit usually 2–4-articulate ..... 2. *Z. thymifolia*

The two species occurring in Panama tend to intergrade, and a number of collections are not clearly assignable between the two species. A more intensive study may lead to an understanding of this pattern and a better means of separation. Collections of dubious assignment are placed under *Z. reticulata* and marked with an asterisk.

While Mohlenbrock (1961) cited a Panamanian collection, *Pittier 4846* (NY, US), as *Zornia curvata* Mohlenbrock, this collection appears too close to *Z. reticulata* to allow distinction. This specimen is also cited under his description of *Z. reticulata* and may indicate his actual intentions, since these sheets are annotated as *Z. reticulata* by Mohlenbrock.

1. **Zornia reticulata** J. E. Smith in Rees,[102] Cycl. 39(2). 1819. TYPE: LINN, not seen; neotype (designated by Mohlenbrock 1961): Jamaica: St. Catherine, *Harris 12070* (US).—FIG. 55.

Perennial *herb*, stems prostrate to erect, to 75 cm long, branched, pilose to glabrous. *Leaves* 2-foliolate; lower leaflets broadly lanceolate to ovate-lanceolate, acute, to ca. 20 mm long, ca. 8 mm wide, the upper leaflets lanceolate to linear, acute, to 20 mm long, ca. (2–)3–5(–8), punctate or epunctate, villous to glabrous below, glabrate above, exstipellate; stipules peltate, glabrous to villous, punctate or epunctate, 5- to 9-nerved, attenuate at each end. *Inflorescence* spicate, usually crowded, many flowered; bracts lanceolate to lance-ovate, acute to acuminate, to 12 mm long, 8 mm wide, the auricle to 3.5 mm long, often falcate, glabrous to densely villous, 5- to 9-nerved. *Flowers* yellow, mostly concealed by bracts. *Fruit* 4- to 7-articulate, usually included in bracts, articles 2.0–2.4 mm long, ca. 2 mm wide, usually reticulate, pilose to villous, bristles retrorsely hairy, 0.2–0.4 mm long, eglandular.

Zornia reticulata is widely distributed from the southern United States through Central and South America to Paraguay. In Panama, it is a common element in grasslands and disturbed sites, usually at lower elevations. It is a most variable species, with leaflets varying as to size and pubescence. This species is distinguished from the following species by its more robust, erect habit; larger leaves and leaflets; and the bracts of the inflorescence peltate and usually having a falcate auricle.

Collections of dubious assignment are cited below with an asterisk (*); see generic discussion above.

CANAL ZONE: Sosa Hill, *Duke 4654* (GH, MO). Paraiso, *Killip 3384* (US). Farfan Beach, *Lewis et al. 305* (DUKE, F, GH, MO, NY, SCZ, US).* Corozal, *Standley 27383* (US). CHIRIQUÍ: near Horconcitos, *Burt & Koster 170* (MO). David to Concepción, *Burt & Koster 136* (MO).* Boquete, *Davidson 702* (F, GH, MO, US). Cerro Colorado, *Folsom 4909* (MO). Rio Las Guias, *Folsom & Collins 6861* (MO). David airport, *Lewis et al. 754* (GH, MO, US). 5 mi S of Boquete, *McDaniel 6798* (FSU, MO). Vicinity of Boquete, *Stern et al. 1162* (GH, MO); *Woodson & Schery 783* (MO, US). COCLÉ: Río Hato Airstrip, *Blum & Dwyer 2466* (FSU, GH, MO, SCZ); *Burch et al. 1138* (F, GH, MO, NY, US). 4–6 mi E of Natá, *Duke 12379* (NY).* Penonomé, *Ebinger 997* (F, MO, US). Aguadulce, *Pittier 4846* (NY, US). Penonomé, *Williams 124* (NY, US). Without other locality, *Williams 125* (NY, US). COLÓN: 4 km E of Buena Vista, *Nee 7792* (MO). Ft. Sherman, *Dwyer 7226* (MO).* LOS SANTOS: Chitré to Los Tablas, *Burt & Rattray 50* (MO).* Between Tonosí & Macaracas,

[102] For synonymy see Mohlenbrock, 1961.

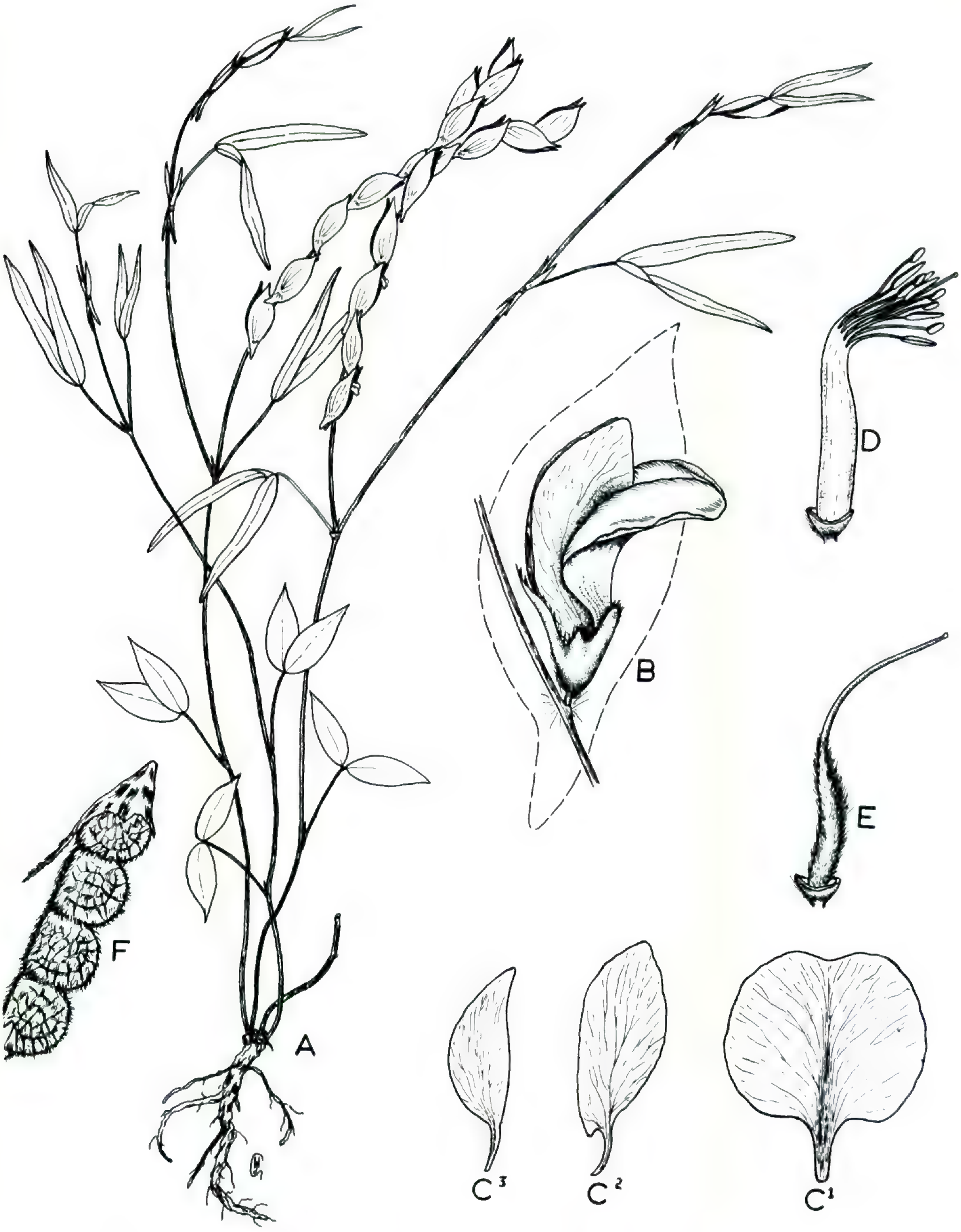

FIGURE 55. *Zornia reticulata* J. E. Smith.—A. Habit (×½). [After *Ebinger 1162.*] B. Flower (×3½).—C. Corolla.—C^1. Standard (×3).—C^2. Wing petal (×3).—C^3. Keel petal (×3).—D. Stamens (×4).—E. Pistil (×4). [After *Davidson 702.*]—F. Fruit (×4). [After *Skutch 2942.*]

Oliver et al. 3550 (MO).* 12 mi S of Macaracas, *Tyson et al. 2934* (MO, SCZ). HERRERA: El Portrero to Las Minas, *Burt & Koster 89* (MO).* PANAMÁ: Cerro Campana, *Dwyer et al. 4717* (MO). Between Río Pacora and Chepo, *Dwyer et al. 5097* (MO). Las Sabanas, *Heriberto 141* (US); *Paul 537* (US). Pacora to Chepo, *McDaniel 8182* (DUKE, FSU). Alcalde Díaz, *Nee 8302* (MO). Tapia to Pacora, *Piper 5123* (US). Laguna de Portala, *Pittier 4625* (US). Las Sabanas, *Standley 25890* (US). Juan

Franco Race Track, near Panamá, *Standley 27823* (US). VERAGUAS: W of Soná, *Allen 1052* (MO). Divisa to Santiago, *Burt & Rattray 76* (MO).* 5 km S of Santa Fé, *Nee 8127* (MO). 2 km NW of Atalaya, *Nee 8238* (MO). 5 mi W of Rincon, *Wilbur et al. 15387* (DUKE).

2. **Zornia thymifolia** H.B.K., Nov. Gen. Sp. Pl. 6: 514. 1823. TYPE: Mexico: *Humboldt* (B-Willd. 13772, not seen; MO, microfiche).

Hedysarum clandestinum Willd. ex Steud., Nom. Bot., ed. 1. 730. 1840, nomen nud.

Perennial *herb*; stems prostrate, spreading, to 30 cm long, branched, puberulent to glabrous. *Leaves* 2-foliolate; lower leaflets lanceolate to ovate, obtuse to acute, glabrous to sericeous above, sparsely to densely sericeous below, usually punctate, exstipellate; stipules peltate, 3- to 5-nerved, attenuate above, obtuse to acute below, usually punctate, glabrous. *Inflorescence* spicate, congested, several flowered; bracts ovate, acute, ciliate, glabrous to puberulent, punctate, 5- to 7-nerved, ca. 10 mm long, ca. 5 mm wide, attached basally or nearly so, auricle oblique. *Flowers* yellow. *Fruit* 2- to 4-articulate, the articles ca. 2 mm long, ca. 2 mm wide, reticulate, glabrous or rarely puberulent, the bristles glabrous or retrorsely hairy, eglandular.

Zornia thymifolia is relatively common throughout Mexico and Central America to Panama, usually found in rocky grassland at mid and high elevations. In Panama, this species is apparently confined to old lava fields around the volcano Barú, Chiriqui Province. This species is also quite variable for overall habit size, and size and shape of the leaflets. The fruits are variable for pubescence, with some individuals from a given collection (e.g. *Tyson 5830*) either pubescent and with retrorsely hairy bristles, or completely glabrous with bristles lacking pubescence.

The species is distinguished from *A. reticulata* by its smaller habit and leaflet size, and the bracts of the inflorescence attached basally or if peltate, then the auricle small, obtuse and oblique.

Mohlenbrock (1961) has designated a neotype (*Pringle 726*, F) for this species; however, Humboldt's specimen is extant in the Willdenow Herbarium (B) (#13772) under the name *Hedysarum clandestinum* and is most certainly the holotype for this species.

CHIRIQUÍ: Llano de Volcán, *Allen 4852* (GH, MO). Camino a Cerro Punta, 5 km NW del Hato de Volcán, *Correa 1361* (DUKE, MO). Ca. 3 km NE of El Hato del Volcán, *Davidse & D'Arcy 10342* (MO), *10348* (MO). Lava fields near the town of Volcán, *Duke 9155* (MO, OS), *9220* (MO). El Hato (Volcán), *Ebinger 780* (GH, MO, US). Boquete, *Lewis et al. 397* (GH, MO, US). Frances Arriba School ca. 14 mi N of David, *Lewis et al. 651* (DUKE, F, GH, MO, NY, SCZ, US). Llanos del Volcán, *Seibert 339* (GH, MO). 3 mi N of El Volcán, *Tyson 5830* (DUKE, FSU, MO, SCZ). NE of El Hato del Volcán, *Wilbur et al. 17206* (DUKE).

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ANNALS
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VOLUME 67 1980 NUMBER 4

FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part IV

FAMILY 61. CERATOPHYLLACEAE

W. G. D'ARCY[2]

Submerged aquatic *herbs*, the stems branching; roots wanting. *Leaves* verticillate, finely dissected; stipules wanting. *Inflorescences* solitary or clustered flowers in the leaf axils; pedicels short. *Flowers* unisexual, minute; perianth of ca. 10 basally united segments, the staminate flowers with ca. 10 subsessile, erect stamens, the 2 thecas oblong, longitudinally dehiscent, the connective enlarged and prolonged; ovary superior, carpel 1, locule 1, ovule 1, pendant, anatropous, the placentation parietal, the style slender. *Fruit* a nut; seed 1, the embryo straight, endosperm wanting.

The Ceratophyllaceae comprises one genus of near cosmopolitan distribution. The plants occur in still fresh water.

CERATOPHYLLUM

Ceratophyllum L., Sp. Pl. 662. 1753; Gen. Pl., ed. 5. 428. 1754. TYPE: *C. demersum* L.

Submerged aquatic *herbs*; stems branching; roots wanting. *Leaves* verticillate, flat, dissected, sometimes serrate. *Inflorescences* of solitary or clustered flowers in the leaf axils. *Flowers* unisexual, the calyx many segmented, the sepals basally united, the staminate flowers with about a dozen erect, subsessile stamens, the pistillate flowers with a single superior ovary, locule 1, ovule 1, the

[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator).

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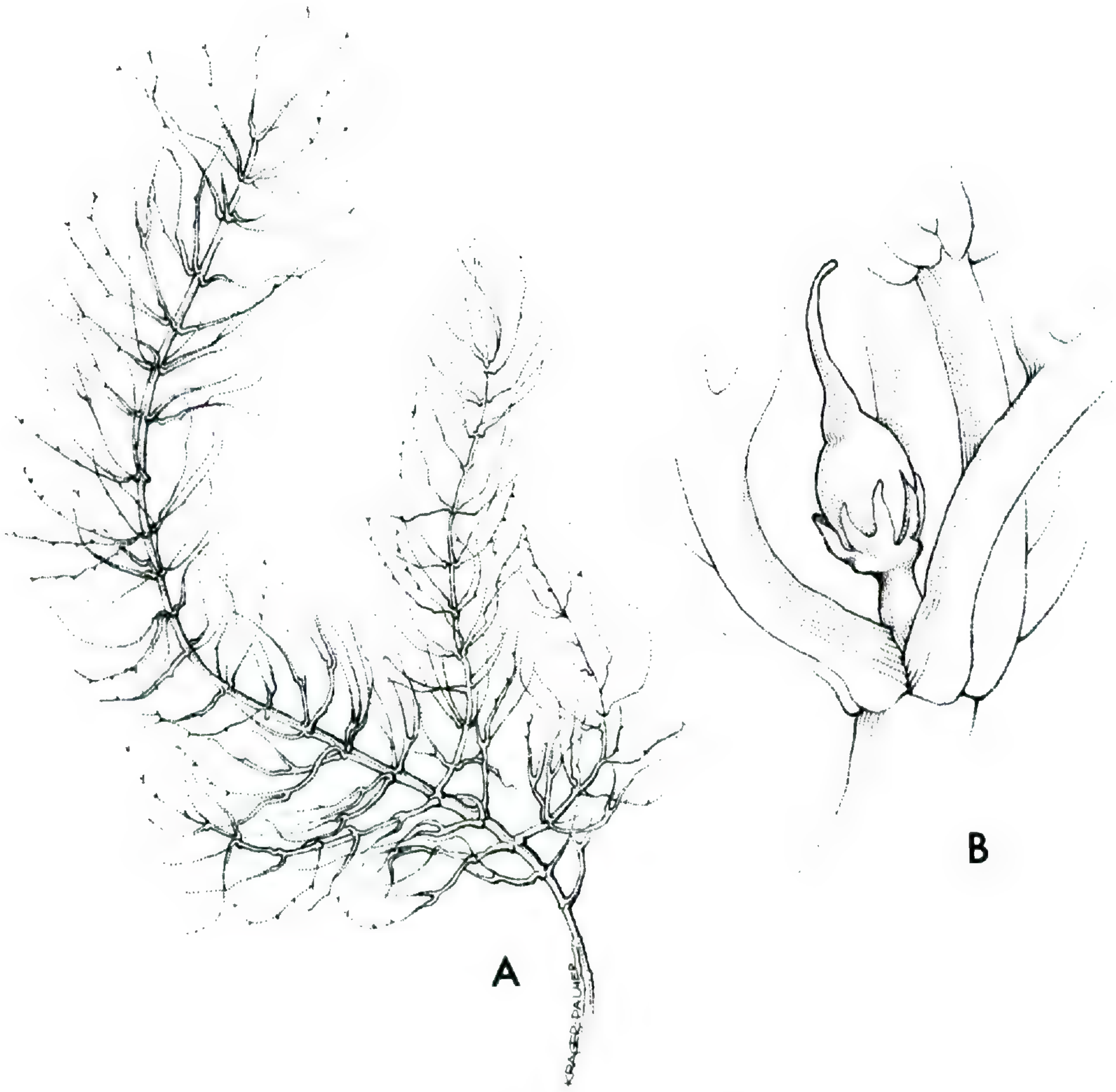

FIGURE 1. *Ceratophyllum demersum* L.—A. Habit (×3/5). [After *Nee 7210* (MO).]—B. Fruit. [Adapted from Correll, D. S. & H. B. Correll. Aquatic and Wetland Plants of the Southwestern United States. Environmental Protection Agency. 1972.]

placentation parietal, the style slender. *Fruit* a nut exserted from the perianth, the style persistent.

Ceratophyllum includes 1–10 species depending on circumscription. All plants are quite similar in being dissected, branching submerged aquatics with minute axillary flowers. The genus occurs in fresh waters in most parts of the world, and is food for wild fowl and other fauna. The masses of intricate leaves and stems also provide hiding places for many small animals, including mosquito larvae.

1. **Ceratophyllum demersum** L., Sp. Pl. 992. 1753. LECTOTYPE: Europe, herb. Linnaeus (LINN 1122.1, not seen; MO, microfiche).—FIG. 1.

Dissected submerged aquatic *herbs*; stems green, glabrous or with sparse weak trichomes, to 0.5 mm in diam., to 3 m long, branching, flexuous; roots lacking. *Leaves* verticillate, often 6–10 at a node, linear to filiform, flat, dichot-

omously branching 1–3 times, the ultimate segments ca. 0.5 mm wide, mostly 0.75–1.5 cm long, sparingly irregularly serrate, the teeth often projected into a transparent cusp. *Inflorescences* solitary axillary flowers; pedicels short. *Flowers* unisexual, minute, sometimes pinkish, calyx of ca. 10 sepals, basally connate, narrowly deltoid, ca. 1 mm long, the staminate flowers with the ca. 10 stamens spiralling on a flat torus, filaments obsolete, the anthers linear; the pistillate flowers with a single superior, 1-carpellate ovary, the ovule 1. *Fruit* a tuberculate nut, ca. 1.5 mm long, mostly cuspidate.

This species may be recognized by its dissected, flat verticillate leaves and the branching of the stems.

Ceratophyllum demersum is found in still fresh waters in most temperate and tropical countries in the world. In Panama it has been collected in the Canal and in lowland waters adjacent to it.

CANAL ZONE: Río Mandinga near Bamboa, 1 mi up from Canal, *Kennedy 2375* (MO). 3 mi above Gamboa on Chagres River, *Lazor & Boreham 2927* (MO). Gatún Lake and Chagres River, *Lazor & Tyson 5702* (MO). Railroad and Panama Canal 6 km W of Gamboa, 30–40 m, *Nee 7210* (MO). Chagres River ½ mi N of Gamboa, *Nee 8730* (MO). Edge of Caimitillo Arm, a bay of Miraflores Lake, *Nee 10194* (MO).

INDEX OF LATIN NAMES

Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part IV

FAMILY 84. OXALIDACEAE

ALICIA LOURTEIG[2]

Trees, *shrubs* or *herbs*. *Leaves* alternate, subopposite or apparently basal, 1–multipinnate; stipules absent or connate to the petiole. *Inflorescences* axillary or cauliflorous, bifid or umbelliform cymes, rarely solitary flowers, or panicles of cymes. *Flowers* actinomorphic, hermaphrodite, sometimes cleistogamous; calyx 5-partite, imbricate; petals 5, hypogynous, free or connate near the middle, contorted, the upper part enlarged, white, yellowish to orange, or pink to violaceous, the base clawed; stamens 10 (5 + 5), hypogynous, connate or almost free, sometimes only 5 bearing anthers, the anthers ovoid, 2-locular, opening lengthwise; ovary superior, 5-carpellate, generally 5-lobed, 5-locular, the carpels with 2–15 ovules, the ovules axile, pendulous, the styles 5, free, persistent, the stigma shortly bifid or 2-capitate. *Fruit* a 5-lobed capsule or berry, 5-locular, the calyx and styles persistent, the dehiscence loculicidal; seeds often projected by an elastic tegument, the endosperm fleshy, the embryo straight.

The Oxalidaceae is a family of 6 genera and about 950 species distributed worldwide from tropical to cold regions. *Dapania* and *Sarcotheca* occur in the Old World, *Oxalis* is cosmopolitan, *Averrhoa* is mostly cultivated in tropical regions, *Biophytum* occurs in tropical regions and *Hypseocharis* is endemic to the tropical Andes. Only three genera are represented in the flora of Panama, one of which is cultivated.

a. Trees; leaves imparipinnate; fruit an indehiscent fleshy berry ..... 1. *Averrhoa*
aa. Small subshrubs or herbs; fruit a dehiscent capsule.
  b. Leaves multifoliolate, the last foliole reduced to a mucro or bristle; capsules loculicidal in a radiate form, the carpels after dehiscence attached to the axis only at the base ..... 2. *Biophytum*
  bb. Leaves 3-foliolate; capsules loculicidal by longitudinal slits, the carpels after dehiscence attached along their full length to the central axis ..... 3. *Oxalis*

Literature:

Lourteig, A. 1975. Oxalidaceae extra-austroamericanae. I. *Oxalis* L. Sectio *Thamnoxys* Planchon. Phytologia 29: 449–471.

———. 1979. Oxalidaceae extra-austroamericanae. II. *Oxalis* L. Sectio *Corniculatae* DC. Phytologia 42: 57–198.

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[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator).

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1. AVERRHOA

Averrhoa L., Sp. Pl. 428. 1753; Gen. Pl. ed. 5. 196. 1754. TYPE: *A. bilimbi* L.

Carambola Adans., Fam. Pl. 2: 508. 1763.
Oxynis Noronha, Verh. Batav. Gen. 5: Art. 4. 13. 1790.

Small to large branched *trees*. *Leaves* imparipinnate. *Inflorescences* of cymes united in racemes, then in fascicles or pseudopanicles, axillary or cauliflorous; bracts and bracteoles subulate, caducous. *Flowers* heterostylous; sepals shortly connate at the base, imbricate; petals hypogynous, contorted, free or connate near the middle; stamens 10 (5 + 5) or 5 fertile and 5 staminodes; ovary 5-lobed, the carpels 2–7 ovuled. *Berries* indehiscent; seeds 2–several in each carpel, the endosperm fleshy, the outer tegument present or absent.

a. Leaves 7–20 jugate, pseudoverticillate at the apex of the branches; petals 10–20 cm long, purplish, glabrous inside; fertile stamens 10; berry oblong-cylindric, slightly lobed to smooth; seed without outer tegument ---------- 1. *A. bilimbi*
aa. Leaves 3–8 jugate, distributed along the branches; petals to 9 mm long, violaceous, the borders white, minutely glandular inside; fertile stamens 5; berry ovoid, asymmetric, deeply 5-lobed; seeds with outer tegument ---------- 2. *A. carambola*

1. **Averrhoa bilimbi** L., Sp. Pl. 428. 1753. TYPE: Ceylon, *Hermann* ex herb. Banks no. 177, 1672–1677 (BM).

Tree to 15 m tall, 30 cm diam.; branches ascending, new branches and rachis densely yellow or rusty tomentose. *Leaves* pseudoverticillate at the top of the branches, 7–20 jugate, ovate to 65 cm long; leaflets alike, discolorous, oblong or elliptical, asymmetrical, 2.5–15 cm long, 1–5 cm wide, the lower leaflets smaller, 1–2 cm long 1–1.5 cm wide, acute or acuminate with a mucro 2 mm long, the base rounded or subcuneate, softly pubescent on both sides, more so beneath and above on the midrib; petiolules fleshy, tomentose; petiole pubescent, to 17 cm long, enlarged at the base. *Inflorescences* axillary or often cauliflorous on aborted branches, sometimes even on the lower part of the trunk, of cymes forming racemes or panicles, 15–20-flowered, or of solitary flowers, pubescent and glandular; bracts ca. 4 mm long, bracteoles 1.5–2 mm long, both subulate, densely tomentose; pedicels 4–20 mm long, articulate near the middle. *Flowers* with the sepals 5–2.5 mm long, 1.5–3 mm wide, ovate to elliptical, asymmetrical, acute, mucronate, one internal sepal oblong and obtuse, pubescence appressed and glandular inside and out, green yellow to purplish; petals purplish, free or sometimes connate near the middle, linear spathulate, 10–20 mm long, 2.5–4 mm wide, clawed, caducous, apically with a short caducous cilium and minute glandular hairs; stamens 10, nearly free, glabrous, the longer 10 mm and the shorter 4 mm long, the anthers suborbicular, the connective conspicuous; pistils mostly mesostylous, 7.5–12 mm long, the ovary cylindrical, 5-lobate, 4–7.5 mm long, acute, lengthened into the styles, the styles cylindrical, ca. 2 mm long, 2-lobed or truncate, densely appressed pilose, the hairs yellow, straight, ascending, the stigma inconspicuous, liguliform or subulate, the carpels with (1–3–)4–7 ovules. *Berry* oblong, to 7.5 cm long, 3.5 cm in diam., 5-lobate or smooth, in transverse section subcircular or pentagonal, the base roundish, the apex lobulate; seeds 4–7 per carpel.

FIGURE 1. *Averrhoa carambola* L. Habit (×½). [After *Chi-en Chang 8567*, Taiwan.]

Averrhoa bilimbi is a widespread tree in tropical regions. Frequent in the Orient, in America it is known only in botanical gardens and experiment stations.

CANAL ZONE: Summit Garden, *Steyermark* 6, 7, 17.I.1935 (MO).

2. **Averrhoa carambola** L., Sp. Pl. 428. 1753. TYPE: Ceylon, *Hermann* ex herb. Banks no. 178, 1672–1677 (BM).—FIG. 1.

Tree to 25 m tall, 25 cm diam., abundantly branched; branches sometimes drooping; pubescence of short curved whitish to reddish ascending deciduous hairs. *Leaves* disposed along the branches, 3–8 jugate, the leaflets alternate or subopposite, discolorous, variable in shape, asymmetric, the upper leaflets elliptical or ovate, oblong, cuspidate, basally rounded or truncate, the lower leaflets smaller, 1.5–3 cm long, 1–2 cm wide, acuminate or cuspidate, the secondary nerves 4–10 pairs, the pubescence short and even beneath, the nerves pubescent above, the margin appressed ciliate; rachis to 20 cm long, rigid, pubescent; petiolules thick, 1.5–3 mm long; petioles to 3.5 cm long, pubescent, thickened towards the base. *Inflorescences* axillary or cauliflorous, of pubescent and glandular cymes united into racemes and these into fascicles or pseudo-panicles; peduncle to 1 cm long; pedicels 3–4 mm long. *Flowers* with the sepals oblong or obovate oblong, 2.5–3.5 mm long, 1–2 mm wide, obtuse and somewhat emarginate, rarely subacute, a few hairs appressed on the central zone, the margin irregular, hyaline, finely ciliate; petals violaceous, white bordered, linear spatulate, 6.5–9 mm long, 1.5–3 mm wide, clawed, connate at the middle, seldom free, densely glandular inside; stamens enlarged toward the base, connate up to $^1/_5$, the anthers orbicular, the connective conspicuous, the longer stamens 2–2.5 mm long, fertile, the shorter stamens without anthers, seldom with rudimentary anthers (*D'Arcy & D'Arcy 6799* and others), or rarely with 2 rudimentary thecas separated by a short connective, in macrostylous flowers the longer stamens with small glands on the upper half, in mesostylous flowers (most frequent) the short stamens very short, microstylous flowers not seen; pistils 3–4 mm long, sometimes glandular, the ovary ellipsoid, the pubescence scant, appressed, sometimes only on the back of the carpels, the carpels 3–5-ovuled, the styles short, thick, pilose, the stigma enlarged, 2-lobed. *Berry* greenish or yellow, ovoid or ellipsoid, asymmetric, 8–12.5 cm long, 5–6 cm wide, the carpels uneven, angular, the base and apex 5-lobed, in transverse section 5-rayed; seeds without outer integument.

This species is frequently cultivated in all tropical regions. It probably originated in the Orient and was introduced into America. Fruits are consumed fresh or in conserves, also as refreshments.

CANAL ZONE: Barro Colorado Island, *Foster 2190* (US). PANAMÁ: Tobago Island, *D'Arcy & D'Arcy 6799* (MO).

2. BIOPHYTUM

Biophytum DC., Prodr. 1: 140. 1824. LECTOTYPE: *B. sensitivum* (L.) DC.

Oxalis L. sect. *Biophytum* Endl., Gen. 1172. 1840.
Toddavaddia Kuntze, Rev. Gen. Pl. 1: 96. 1891.

Herbs or *subshrubs*, erect or decumbent, the base sometimes ligneous; stems generally bearing a ring of rigid, retrorse pubescene at the apex. *Leaves* fasciculate at the stem apex, imparipinnate, the terminal leaflet reduced to a bristle-like mucro; leaflets subsessile, the pairs gradually modified in shape and size upwards, the lower pairs usually subtriangular or ovate, smaller, petiolule minute, broader than long, fleshy; petiole short, thick, articulating at the rachis, the bases persistent on the stem. *Inflorescences* of cymes, globose or cylindric; peduncu-

late; bracts subulate, situated at the insertion of the peduncles; bracteoles spirally overlapping; pedicels shorter or longer than the bracteoles, articulate near the base, the flowers opening successively, often only 1 or 2 to several seen opened to different degrees. *Flowers* white to red; sepals almost free, imbricate; petals connate near the middle; stamens short-connate at the base, all fertile or sometimes the shorter stamens reduced and sterile; ovary 5-lobed, the carpels 2–6-ovulate, the ovules in two rows alternating in length, the stigmas terminal, enlarged, bifid, subcapitate, papillose. *Fruit* a capsule covered by the calyx, the carpels 1–6-seeded, loculicidally dehiscent, the valves opening flat over the sepals in a star shape, remaining attached at the base; seeds 2-tegmic, the outer tegument opening and ejaculating the seed at maturity.

Biophytum is a pantropical genus of about 75 species. Five species occur in Panama, 3 of which are endemic.

a. Cymes glomeruliform or fusiform, 1–2 mm diameter; few-bracteolate.
  b. Pubescence hirsute, the hairs with thickened bases; bracteoles long setose ---- 1. *B. dendroides*
  bb. Pubescence very short, more or less appressed; bracteoles appressed ciliate ---- 5. *B. soukupii*
aa. Cymes globose or cylidroid, ca. 5 mm diameter; bracteoles subtriangular, keeled.
  c. Peduncles ca. 10 cm long; calyx and capsule glabrous ---- 3. *B. mucronatum*
  cc. Peduncles to 2 cm long; calyx pubescent and glandular, the capsule pubescent at the apex.
    d. Leaflets oblong, the distal border obtuse, mucronate; petals white, the throat yellow ---- 4. *B. panamense*
    dd. Leaflets falcate, acute, mucronate; petals yellow, red-veined ---- 2. *B. falcifolium*

1. **Biophytum dendroides** (H.B.K.) DC., Prodr. 1: 690. 1824.—Fig. 2.

Oxalis dendroides H.B.K., Nov. Gen. Sp. Pl. 5: 194. 1821. TYPE: Colombia, near Quebrada de la Carbonera, *Bonpland 1744* (P, holotype; B, P, isotypes).
O. viva Willd. ex Steud., Nom. ed. 2. 2: 242. 1844. TYPE: Colombia, *Bonpland 1744* (B, holotype; P, isotypes), nom. illeg. incl. typ. sp. prior.
Toddavaddia dendroides (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 96. 1891.
Biophytum mexicanum Kl. ex Knuth, Pflanzenr. 130: 401. 1930, nom. nud. in syn.
B. longiscapum Kl. ex Knuth, Pflanzenr. 130: 401. 1930, nom. nud. in syn.
Oxalis dendroides fo. *longiscapa* Zucc. ex Knuth, Pflanzenr. 130: 140. 1930, nom. nud. in syn.
Biophytum mimosoides sensu auct., non (St. Hil.) Guillaumin.
B. dormiens sensu auct., non Mart. & Zucc.

Rhizomatous *herb*, stems obsolete or to 35 cm tall and woody, to 5 cm diam.; rooting up to 20 cm from the base, sometimes 2- or 4-branched; bark rough, appressed retrorse pubescent, glabrescent; root fibrous, to 10 cm long, twisted, branched. *Leaves* pseudoverticillate at the end of the stems, 15–30, 9–26 jugate, linear in outline, subcuneate; lower leaflets ovate to subtriangular, asymmetric, 1–2.5 mm long, 1–2.5 mm wide, the middle leaflets subrectangular to subfalcate, 2.5–10 mm long, 1.5–7 mm wide, the terminal leaflets semiobovate, asymmetric, basally truncate to subhastate, 6–11 mm long, 2.5–5 mm wide, the leaflets sometimes overlapping, glabrous or sparsely hirsute on one or both sides, hirsute ciliate, obtuse or subacute, the mucro sometimes violaceous, the midrib medial or emerging from nearer the posterior angle, secondary nerves ascending, curved, branched, connected to a marginal nerve; rachis 2–10 cm long, hirsute, more so at the insertion of the leaflets; petiolules ¼ mm long, thick, fleshy; petiole 1 mm

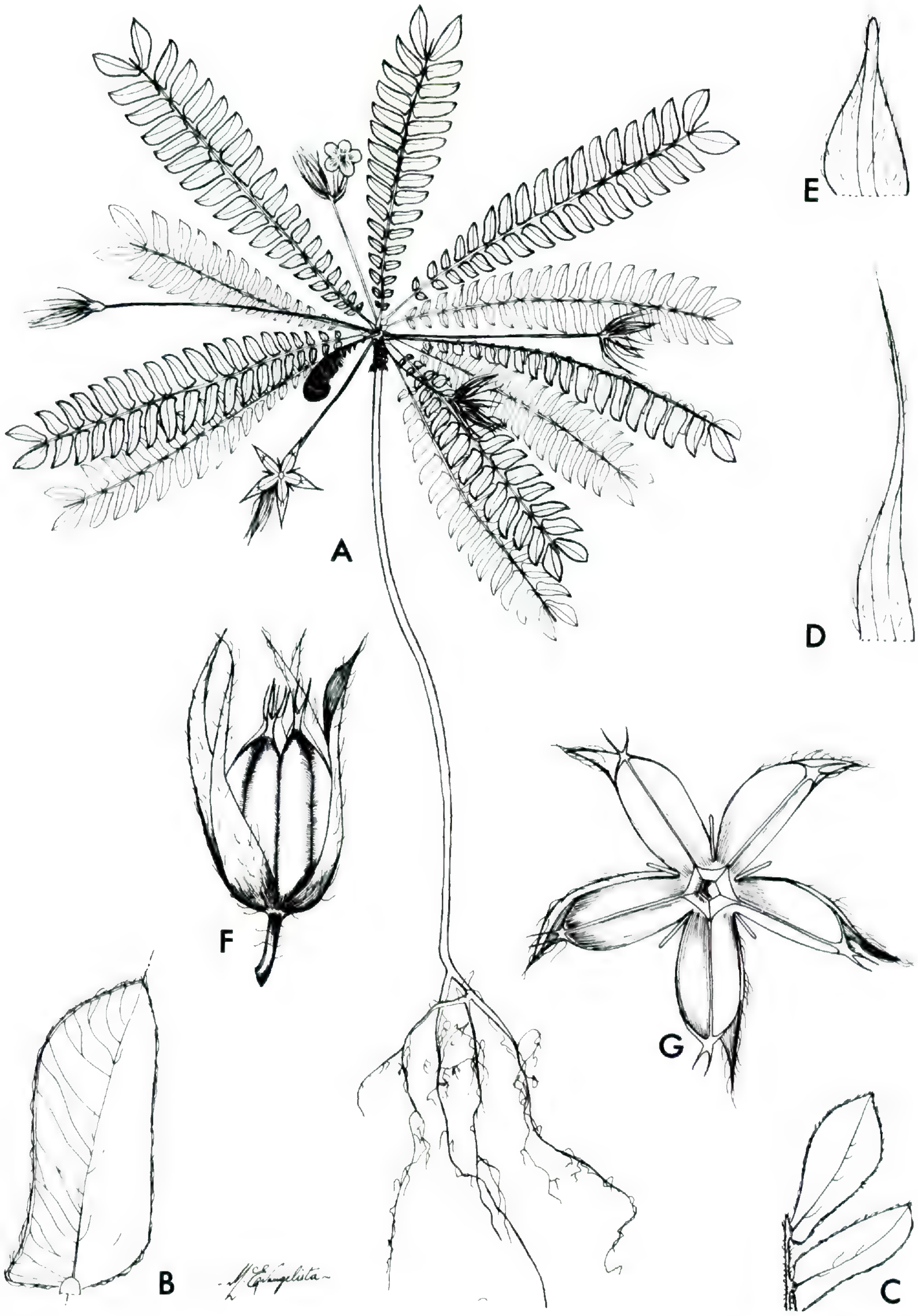

FIGURE 2. *Biophytum dendroides* (H.B.K.) DC.—A. Habit (×1).—B. Middle leaflet, upper and lower surfaces (×5).—C. Terminal leaflets (×3).—D. Inner bracteole (×6).—E. Outer bracteole (×6).—F. Fruit (×6).—G. Fruit in dehiscence (×6). [After a plant cultivated in Paris and studied by Lourteig.]

long, fleshy. *Inflorescences* subsessile or pedunculate, shortened, glomeruliform or fusiform, only 1 flower appearing at a time; peduncle erect, 1–8 cm long, subappressed pubescent or hirsute, the apex thickened, densely pilose; bracts subulate, to 6 mm long, purplish, pubescent; bracteoles 2–7 mm long, 0.5–1.5 mm wide, triangular linear to linear, the inner bracteoles prominently keeled, the keels somewhat lengthened, ascending ciliate; exceeding or about equalling the pedicels; pedicels 1–5 mm long, articulate in the lower half, glabrous or finely pubescent. *Flowers* with the sepals linear, 5–7 mm long, 1–1.5 mm wide, acuminate, 7–10-nerved, glabrous or ascending pubescent, the base densely hirsute, the apex ciliate; petals whitish to pink or lilac, the base obovate or spathulate, 1.5–1.3 times the calyx length, slightly retuse, the base clawed, white; stamens with the filaments basally enlarged, glabrous, the longer stamens 4.5–5.5 mm long, the shorter stamens 3–4 mm long; pistils micro- and macrostylous, the ovary apically pilose, the carpels 1–6-ovuled, the styles sometimes unequal, pilose below, the stigma small, bifid. *Capsule* subglobose or oblong, 2.5–4 mm long, yellowish to violaceous, scarious, apically pubescent, or rarely pubescent overall, exceeded 1.75–2 times by the calyx, the carpels 1–6-seeded, short pubescent within; seeds semiovoid-triquetrous, one face more or less plane with an acute margin and the opposite face convex, 1.5 mm long, acute, longitudinally tuberculate.

This species ranges along the American cordillera from Mexico to Ecuador. It has been introduced with greenhouse plants to botanic gardens on other continents, in some cases becoming subspontaneous, for example in Malasia and Brazil. However, records from Knuth (1930) for Brazil are not this species.

COCLÉ: Mountain beyond La Pintada, 400–600 m, *Hunter & Allen 615* (F, GH, MO, NY, P, U, US).

2. **Biophytum falcifolium** Lourt.[3] TYPE: Panama, *Folsom & Collins 5609* (MO, holotype; P, isotype).—FIG. 3A.

Erect or decumbent *herbs* to 20 cm long; stems single or basally branched, with curved, short pubescence, glabrescent; root fibrous, branched. *Leaves* 9–20 pseudoverticillate at the end of the stem, linear subcuneate, to 15 cm long, 1.6 cm wide, 13–34 jugate; lower leaflets ovate or subtriangular, ca. 3 mm long, 1.5 mm wide, the middle leaflets falcate, 5.6–11 mm long, 2.5–4 mm wide, basally the posterior side curved, the anterior side slightly curved or truncate at the midrib, central or emerging from nearer the posterior angle, the terminal leaflets elliptical, asymmetric, about equalling or shorter than the middle leaflets, the leaflets opposite or subopposite, subacute, the mucro 0.1–0.2 mm long, fine pubescent on both sides or glabrous or glabrescent above, ciliate, the minor venation reticulate; petiole ca. 1 cm long, fleshy; rachis narrowly winged, minutely pubescent above, hirsute beneath; petiolules wider than long, 0.1–0.2 mm long, fleshy. *Inflorescences* 1–3, globose or cylindric, 1–3(–5) flowers seen at different degrees of opening; peduncles 0–7 mm long, violaceous, glabrous or minutely

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[3] *Biophytum falcifolium* Lourt. spec. nov. *Biophytum panamense* Lourt. simile, differt forma foliolorum, colore petalorum (fide collectores), etiam bracteolis pubescentiaque.

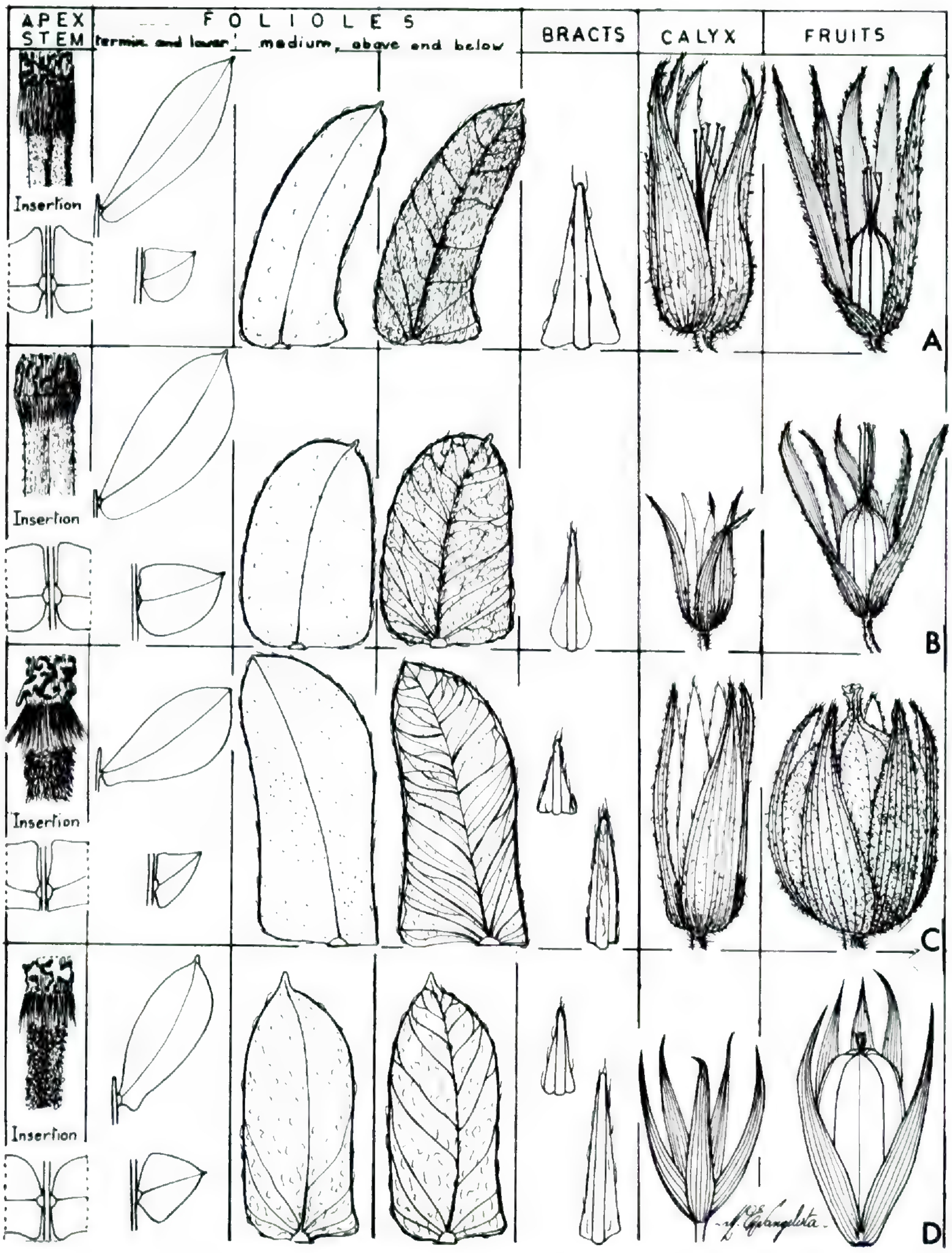

FIGURE 3. *Biophytum*, diagnostic plate.—A. *Biophytum falcifolium* Lourt. [After *Collins 6500.*]—B. *Biophytum panamense* Lourt. [After *Hammel 2528.*]—C. *Biophytum soukupii* Lourt. [After *Williams 765*; *Bristan 1322.*]—D. *Biophytum mucronatum* Lourt. [After *Allen 3775.*] Stems and leaflets (folioles) (×4), bracts and fruits (×10), calyces (×10) except B. *Biophytum panamense* (×6).

pubescent; bracts subulate, ca. 2.5 mm long, purplish, situated at the insertion of the peduncle, sparsely short pilose; bracteoles spirally overlapping, green, basally violaceous, narrowly triangular, 1.5–3 mm long, 1-nerved, strongly keeled, short pubescent and glandular, the hairs 1–several celled; pedicels 7–15 mm long, violaceous, fine pubescent. *Flowers* with sepals linear-elliptic, sharp, 4.5–7 mm long, 0.7–1.2 mm wide, 5–7-nerved, densely glandular, the hairs 1–

several celled; petals cream, pinkish veined, oblong spatulate, the base clawed, 1.5 times the calyx length; longer stamens unequal, 3–3.5 mm long, white, flat with a few glandular hairs; the anthers ovoid with cordate base, the shorter stamens 1–1.5 mm with sterile anthers, or the entire stamen becoming a glandular relic; pistil equalling or shorter than the long stamens, 2.5–3.5 mm long, the style glandular pubescent, the stigma bifid, the ovary 5-lobulate, apically pilose, the carpels 3–4-ovuled. *Capsule* globose, ca. 3.5 mm long, shorter than the calyx, apically glandular pubescent, the carpels 3-seeded; seeds too immature to describe.

This species is closely allied to *Biophytum panamense* but is distinguished by the shape of the leaflets and the white petals. Also the bracteoles and the pubescence are different.

The epithet refers to the shape of the leaflets, curved like a sickle.

COCLÉ: Rivera sawmill, Alto Calvario, 7 km N of El Copé, 700–850 m, *Folsom & Collins 6509* (MO, P). Trail from Río San Juan to Río Tife Falls, 1200–2500 ft, *Hammel 3352A* (MO).

3. **Biophytum mucronatum** Lourt.[4] TYPE: Panama, *Allen 3775* (US, holotype; F, G, MO, isotypes).—FIG. 3D.

Decumbent *herb* or *shrub*; stems woody, 50 cm long, 3–4 cm diam., finely short pubescent, glabrescent, decumbent, rooting at the base. *Leaves* 20–22, pseudoverticillate at the end of the stem, linear subcuneate, to 14 cm long, 2.7 cm wide, 7–27 jugate; lower leaflets suborbicular or ovate, 2–3.5 mm long, the middle leaflets oblong rectangular, oblique, 7–11 mm long, 3–5 mm wide, basally truncate or the posterior side curved, secondary nerves 5–7 pairs, prominent beneath, the terminal leaflets elliptic, 8.5–10 mm long, 2.5–5 mm wide, basally truncate, curved on the posterior side, obliquely truncate on the anterior side,

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[4] *Biophytum mucronatum* Lourt., spec. nov. Radix fibroso ramosa. Caulis lignosus (usque 30 cm altus, 3–4 mm diam.), decumbens, basi radicans, pubescentia brevi tenuique, glabrescens. Apex caulis incrassatus, cum annulo dense pilifero, pilis rigidis, retrorsis, infra foliorum insertionem posito. Caulis supra annulum pilorum foliorum delapsorum cicatricibus instructus. Folia 20–22, pseudoverticillata, in apice caulis disposita, ambitu lineari-subcuneato (usque 14 × 2.7 cm) 7–27-juga imparipinnata cum mucrone terminali. Petiolus 1–3 cm longus, carnosus. Rachis canaliculatus hirsuto-pilosus. Petiolulus ¼ mm longus, carnosus. Foliola opposita, inaequilatera, antice crescendo majora, discolora, supra pubescentia laxa, tenui, adpressa (pilis ca. ½ mm longis) subtus breviter pilosa, glabrescentia; apice insigniter mucronato (mucro ½ mm longus); infima minima, suborbiculata vel ovata (2–3.5 mm longa); media oblique oblongo-rectangularia (7–11 × 3–5 mm), 5–7 jugis secundariorum nervorum subtus prominentium (paria inferiora parallela, superiora subparallela), basi truncata vel dimidio posteriore plus vel minus curvo et dimidio anteriore obliquo; summa elliptica (8.5–10.5 × 2.5–5 mm), basi lobulato-curvata in dimidio posteriore, obliquo-truncata in dimidio anteriore. Cymae 2–5, abbreviatae, globoso-congestae (ca. 5 mm diam.) 1–7 floribus adspectabilibus, vicissim apertis. Pedunculi erecti, longi (7–10 cm), hirsuto-pilosi. Bracteae subulatae, adpresso-ciliatae (3–4 mm) ad pedunculorum insertionibus. Pedicelli bracteolis occulti, glabri, ca. basim articulati. Bracteolae spiraliter superpositae, lineare-triangulares (2.5–4 mm), 1-nervatae, valde carinatae, longae et tenuiter ciliatae. Sepala linearia, acutissima (5 × ca. 1 mm), manifeste (7–)9–11-nervata, glabra. Petala rosea (fide coll.), oblongo-spathulata, basi dentiformi. Petalorum longitudo et latitude ignotae (flos non apertus est). Stamina filamentis flavis: longiora (ca. 2 mm) pauci glanduloso-pilosa, antheris ovoideis; breviora filamento lato in dimidio inferiora, sursum filiformi, anthera reducta (sterilis?). Pistillum plus minusve aequale longioribus staminibus; stigmata minuta, vix bi-capitata, papillosa; ovarium ellipsoideum, 5-lobulatum, carpello 2–3-ovulato. Capsula ellipsoidea (3–5.5 mm) rite calyce minor, glabra (inmatura); carpella 1–2(?)-seminata. Semina inmatura.

the leaflets discolorous with loose appressed hairs ca. ½ mm long above, short pilose and glabrescent beneath, the apical mucro ca. ½ mm long; petioles 1–3 cm long, fleshy; rachis hirsute; petiolule ½ mm long, fleshy. *Inflorescences* 2–5, globose, ca. 5 mm diam., 1–7 flowers seen opened to different degrees, peduncles erect, 7–10 cm long, hirsute; bracts subulate, 3–4 mm long, appressed ciliate, subtending the pedicels; bracteoles spirally overlapping, linear triangular, 2.5–4 mm long, 1-nerved, keeled, fine and long ciliate. *Flowers* with sepals linear, 5 mm long, ca. 1 mm wide, acute, (7–)9–11-nerved, glabrous; petals pink oblong spatulate, basally clawed; stamens with filaments yellow, the longer ones ca. 2 mm long, sparingly glandular pubescent, the anthers ovoid, the shorter filaments with reduced (?) sterile anthers, enlarged in the lower half, filiform above; pistil about equalling the stamens, the ovary ellipsoidal, 5-lobed, the carpels 2–3-ovuled. *Capsule* (immature) ellipsoidal, 3–3.5 mm long, shorter than the calyx, glabrous; seeds 1–2(–?) in each carpel.

The size of the petals is unknown to me because the flowers on the collection are not open.

The epithet used for this species refers to the conspicuous mucro of the leaflets.

PANAMÁ: Cerro Trinidad, 800–1000 m, *Allen 3775* (F, G, MO, US).

4. **Biophytum panamense** Lourt.[5] TYPE: Panama, *Hammel 2528* (MO, holotype; MO, P, isotypes).—FIG. 3B.

Erect or decumbent *herbs* to 20 cm long, the stem branched at the base or not, pubescent with curved, short hairs, glabrescent; roots fibrous, branched.

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[5] *Biophytum panamense* Lourt., spec. nov. Radix fibroso ramosa. Caulis unus, vel plures, erectus vel decumbens (usque 35 cm altus), pubescentia brevi retrorsa. Apex caulis claviformis, cum annulo dense pilifero, pilis rigidis retrorsis, infra foliorum insertionem posito. Caulis supra annulum pilorum foliorum delapsorum cicatricibus instructus. Folia 9–20, pseudoverticillata, in apice caulis disposita, ambitu lineari-subcuneato (usque 18 × 2.2 cm), 20–32-juga, imparipinnata cum mucrone terminali. Petiolus (ca. 2 mm longus) carnosus. Rachis canaliculatus, angustissime alatus, hirsuto-pilosus. Petiolulus latior quam longus (⅓ mm longus) carnosus. Foliola atroviridia, opposita, aliquam superposita, inaequilatera, mucronata (mucro ca. ¼ mm), antice crescendo majora, pubescentia tenuissima et brevissima, glabrescentia, margine ciliata; nerviatione secundaria et tertiaria reticulata; *infima* minima, ovato-triangularia vel suborbiculata (3–4.5 × 3–4 mm); media oblongo-asymmetrica, paulo curvata (5–12 × 6.5–7 mm), latere distali obtuso, nervo medio in medio basis vel paulo viciniore angulo posteriore oriundo; basi dimidio anteriore truncato et dimidio posteriore curvato; *summa* angusto-elliptica usque semiobovata (8–11 × 4–5.5 mm), basi dimidio posteriore lobulato-curvato, dimidio anteriore obliquo-truncata. Cymae 1–3, abbreviatae, globoso- vel cylindrico-congestae (ca. 5 mm diam.), 1–2(–5) floribus adspectabilibus, vicissim apertis. Pedunculi erecti, brevi (ca. 5 mm) violacei, pubescentia brevi. Bracteae violaceae, subulatae (2–2.5 mm) ad pedunculorum insertionibus. Pedicelli longi (10–13 mm) violacei, brevissime pubescentes et glandulosi, ca. basim articulati. Bracteolae sprialiter superpositae, ovatae ad lineares (usque 4 × 1 mm), virides ad basim violaceae, valde carinatae, glabrae vel paulo pubescentes, apice ciliatae. Sepala linearia, acutissima (usque 7 × 1 mm), 5–7-nervata, pubescentia et glandulosa, basim plus minusve violacea, margine subhyalina. Petala alba, fauce flava (fide coll.), oblongo-linearia, obtusa, calycis duplo longiora. Stamina longiora (ca. 4.5 mm), filamentis pilis glandulosis conspersis, antheris ovoideis basim cordatis; breviora (ca. 1 mm) filamento lato versus basim, anthera sterilia vel abortiva. Pistillum plus vel minus aequale longioribus staminibus: ovarium 5-lobulatum, apice vix pubescens, carpello 2–3-ovulato; stylis pubescentibus et glandulosis; stigmata conspicue bifida, papillosa. Capsula sphaeroidea (ca. 3.5 mm diam.), apice vix piloso, rite calyce minor, stylis longis, carpellis 1-seminatis. Semina (ca. 1.5 mm, inmatura), semi-ellipsoidea, fulva, obtusa, verosimiliter longitudinaliter striata vel tuberculata.

Leaves 9–20, pseudoverticillate at the end of the stem, linear subcuneate, 18 cm long, 2.2 cm wide, 20–32 jugate; lower leaflets ovate triangular, 3–4.5 mm long, 3–4 mm wide, middle leaflets oblong, asymmetric, slightly curved, 5–12 mm long, 6.5–7 mm wide, basally the posterior side curved, the anterior side truncate, the midrib emerging from the center or near the posterior angle, the terminal leaflets narrowly elliptic to semiobovate, 8–11.5 mm long, 4–5.5 mm wide, oblique basally the posterior side lobulate, the anterior side truncate, the leaflets somewhat overlapping, minutely fine pubescent, glabrescent, ciliate, the mucro ca. ½ mm long, minor venation reticulate. *Inflorescences* 1–3, contracted, globose to cylindric, ca. 5 cm diam., 1–2(–5) flowers seen at a time, opening successively; peduncle erect, ca. 5 mm long, violaceous, short pubescent; bracts subulate, 2–2.5 mm long, violaceous, situated at the insertion of the peduncles; bracteoles ovate to linear, to 4 mm long, 1 mm wide, green, violaceous at the base, strongly keeled, glabrate; pedicels 10–13 mm long, violaceous, minutely pubescent and glandular. *Flowers* with the sepals linear, to 7 mm long 1 mm wide, sharp, 5–7-nerved, pubescent and glandular, the base violaceous, the margin subhyaline; petals white, linear oblong, obtuse, twice as long as the calyx; longer stamens ca. 4.5 mm long, sparsely glandular, and the anthers ovoid, basally cordate, the shorter stamens ca. 1 mm long, larger basally, the anthers sterile or obsolete; pistil about equalling the longer stamens, the ovary 5-lobed, apically slightly pubescent, the carpels 2–3-ovuled, the styles pubescent and glandular, the stigma bifid, papillose. *Capsule* globose, ca. 3.5 mm diam., slightly pilose apically, shorter than the calyx, the style persistent, elongate, the carpels 1 seeded; seeds (immature) tawny, semiellipsoidal, ca. 1.5 mm long, obtuse, perhaps longitudinally striate or tuberculate.

The epithet refers to the country where the species was found.

COCLÉ: Coclesito road, continental divide ridge, *Hammel 2528* (MO, P).

5. **Biophytum soukupii** Lourt.[6] TYPE: Peru, Prov. Mariscal Cáceres, Tocache Nuevo, Quebrada de Cachiyacu de Lopuna, carretera a Progreso, 500–850 m, *Schunke 7640* (P, holotype; MO, isotype).—FIG. 3C.

Herb or *subshrub* apparently stemless or the stem to 50 cm tall, 4 mm in diam., erect or decumbent, tomentose; root branched, fibrous, elongate. *Leaves*

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[6] *Biophytum soukupii* Lourt., spec. nov. Radix copiose ramosa, longa. Subacaulis vel caule sublignoso erecto vei decumbens, basi radicante, tomentoso-pubescente (usque 50 cm lato × 4 mm diam.). Apex caulis claviformis cum annulo dense pilifero, pilis rigidis, retrorsis, infra foliorum insertionum posito. Caulis supra annulum pilorum foliorum delapsorum cicatricibus instructus. Folia 7–30, viride-purpurea, pseudoverticillata in apice caulis disposita, ambitu lineari-subcuneato (usque 13 × 2.5 cm), 10–25-juga, imparipinnata cum mucrone terminali. Petioles (ca. 2 mm longus), carnosus. Rachis canaliculatus, angustissime alato (alis inconspicuis), pubescentia brevi, subhirsuta, inaequali. Petiolulus (ca. ¼ mm) carnosus, latior quam longus. Foliola discolora viridia et purpurea, opposita, oblique, inaequilatera, nervo mediano in tercio basis viciniore angulo posteriore oriundo; secundariis nervis in 20–35 jugis dispositis, tenuibus et crassis alternatis, in nervo marginalo collectis, in pagina inferiore prominentibus; pubescentia minutissima recta, subappressa, sparsa in utraque pagina vel interdum glabra in una vel duabus paginis; *infima* minima, subtriangularia asymmetrica (ca. 3 × 2.5 mm); *media* oblongo-rectangularia (6–14.5 × 2.5–4.5 mm) obtusa, basi truncata, angulo posteriore recto vel parte anteriore oblique truncata angulo anteriore curvato vel raro elongato; *summa* obovato-elliptica, leviter asymmetrica in medio vix latiora (5.5–6.5 mm), basi dimidio posteriore in angulo

7–30 pseudoverticillate at the end of the stem, linear subcuneate, to 13 cm long, 2.5 cm wide, 10–25-jugate; lower leaflets subtriangular, 3 mm long, 2.5 mm wide, the middle leaflets larger, 6–14 mm long, 2.5–4.5 mm wide, oblong rectangular, obtuse, basally truncate or oblique on the anterior side, the anterior angle roundish, the posterior angle square, the terminal pair obovate elliptic, 5.5–6.5 mm, basally truncate, on the posterior side, the angle square, the anterior side oblique, the leaflets green above, violaceous beneath, oblique, the midrib emerging at the base ⅓ way to the posterior angle, secondary nerves 20–35 pairs, alternating thick and fine, terminating in a marginal nerve, short appressed pubescent on both sides; petiole ca. 0.25 mm long, broader than long. *Inflorescences* 1–4(–7), glomeruliform or fusiform, 5 mm long, 2–2.5 mm wide, one flower opening at a time; peduncle 1–2 cm long, shorter than the leaves, pubescent; bracts situated at the insertion of the peduncles, subulate, 2.5–5 mm long, short appressed pubescent, purplish; outer bracteoles triangular, 1.0 mm long, 0.5 mm wide, inner bracteoles elongate, subulate, keeled, to 3.5 mm long appressed ciliate, sparingly short pilose; pedicels about equalling the bracteoles, somewhat longer, to 3.5 mm, in fruit, articulate near the base. *Flowers* with the sepals sublinear, 5.5–7 mm long, 1–1.5 mm wide, acute, 5–7-nerved, hirsute with long and glandular short hairs; petals white (?pink), oblong spatulate, 1.5 times the calyx length, basally clawed, minutely glandular outside; stamens with filaments enlarged toward the base, the thecas subsagittate, the longer stamens ca. 6.5 mm long, pubescent and glandular, the shorter stamens ca. 3 mm long, glabrous; pistils macro-, meso-, and microstylous and as long as the shorter stamens, the style pubescent and glandular, the stigma enlarged, 2-lobed, subcapitate, papillose, the ovary apically pubescent and glandular, the carpels 4–6-ovuled. *Capsule* oblong, 4.5–5 mm long, about equalling the calyx, apically pubescent and glandular or glabrate, the carpels 4–6-seeded; seeds tawny, semi-ovoid, ca. 1.5 mm long, apiculate, margined, longitudinally tuberculate.

This novelty is named after Father Jaroslav Soukup of the Colegio Salesiano of Lima, Peru, editor of the review *Biota,* enthusiastic botanist who has collected for many years all over Peru, and who has collected this species twice.

DARIÉN: Cabecera del Río Pirre, *Bristan 1322* (MO). Caná, 200–6500 ft, *Gentry et al. 28545* (MO, P), *Williams 765* (NY).

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recto truncato, dimidio anteriore oblique truncato. Cymae 1–4(–7), congestae (5 × 2–2.5 mm), glomeruliformes vel fusiformes plerumque flore uno simul. Pedunculi rite foliis minores (1–2 cm); pubescentiae pedunculi et rachis similis. Bracteae purpureae, subulatae (2.5–5 mm), brevissime adpresso-pilosa ad pedunculorum insertionibus. Pedicelli plus minusve bracteolis aequales, in fructificatione paulo acrescentes (raro usque 3.5 mm), ca. basim articulati. Bracteolae spiraliter disposita exteriores triangulares (1 × 0.5 mm) interiores longae plus minusve setiformes, longe carinatae (usque 3.5 mm). Sepala sublinearia (5.5–7 × 1–1.5 mm), 5–7-nervata, acutissima, pubescentia hirsuta longa et glandulosa brevissima in variabili proportione. Petala alba (rosea?), oblongo spathulata, basi dentiformi 1–3-plo calycis longiora in exteriore parte glandulis minutis inconspicuis. Stamina filamentis versus basim latioribus, antheris thecis subsagittatis; longiora (ca. 6.5 mm) pubescentia et glandulosa; breviora (ca. 3 mm) glabra. Pistillum (macro-, meso- et microstyleum, et staminibus brevibus aequale) ca. 10 mm; styli pubescentia et glandulosa; stigmata aucta 2-lobulata, subcapitata, papillosa; ovarium apice pubescens et glandulosum, carpello 4–6-ovulato. Capsula globosa (4.5–5 mm), calyce aequalis, apice pubescens et glandulosa, carpello 4–6-seminato. Semina fulva, semiovoideo-convexa (ca. 1.5 mm) apiculata, marginata, tuberculis longitudinaliter dispositis ornata.

3. OXALIS

Oxalis L., Sp. Pl. 433. 1753. TYPE: *O. acetosella* L.

Acetosella Moehr, Hort. Priv. 4. 1736.
Oxys [Tourn.] Adanson, Fam. Pl. 2: 388. 1763.
Sassia Molina, Saggio Chile 145. 1782.
Oxallis Noronha, Verh. Batav. Gen. 5. Art. IV, 21. 1790.
Pseudoxalis Rose, Contr. U.S. Natl. Herb. 10: 116. 1906.
Ionoxalis Small, Fl. S.E. U.S. 665. 1903. N. Amer. Fl. 25(1): 26. 1907.
Monoxalis Small, Fl. S.E. U.S. 665. 1903. N. Amer. Fl. 25(1): 45. 1907.
Lotoxalis, Small, Fl. S.E. U.S. 666. 1903. N. Amer. Fl. 25(1): 46. 1907.
Xanthoxalis Small, N. Amer. Fl. 25(1): 49. 1907.
Hesperoxalis Small, N. Amer. Fl. 25(1): 26. 1907.
Otoxalis Small, N. Amer. Fl. 25(1): 27. 1907.
Bolboxalis Small, Fl. S.E. U.S. 665. 1903. N. Amer. Fl. 25(1): 27. 1907.

Herbs or *subshrubs*, rarely lianas; roots branched fibrous or subligneous thickened; stems underground and reduced to an invisible disc covered with bracts and the base of petioles connate to the stipules, or modified in a more or less ligneous, thickened rhizome covered with the base of the decayed leaves, or aerial and climbing, decumbent, trailing or erect, subligneous at the base, or all herbaceous. *Leaves* alternate, apparently basal or cauline, subopposite or pseudoverticillate, 3(–4)-foliolate, digitate or pinnate, with or without stipules connate to the petioles. *Inflorescences* axillary, of 2-branched or umbelliform cymes or solitary flowers; bracteoles 2; bracts small. *Flowers* varying in size, rarely cleistogamous; calyx 5-partite; petals 5, connate near the middle; stamens 10, connate at the base, the series of 5 external alternisepalous stamens opposite the petals, shorter, the internal series alternipetalous, longer, usually all fertile; pistils heterostylous, bi-, trimorphic, the carpels 1–15-ovuled, the styles 5, free, the stigmas capitate. *Capsule* globose, oblong to cylindric, glabrous or pubescent, the carpels (1–)2–15-seeded, loculicidally dehiscent, the carpels connate to the central axis, persistent; seeds generally ovoid, apiculate or oblong, more or less flattened, the testa crustaceous, longitudinally zig-zag ribbed, transversally striate or sculptured densely verrucate, 2-tegmic, the external integument fleshy, arilliform, breaking elastically and projecting the ripe seeds; albumen fleshy; embryo straight.

Oxalis includes more than 800 species distributed around the world in tropical and cold regions, from sea level to the snow-line in the highest mountains. Twelve species have been found in Panama, none endemic.

a. Leaves 3-foliolate, pinnate.
  b. Petals white or yellow at the base, the limb pinkish ---------- 2. *O. barrelieri*
  bb. Petals yellow.
    c. Cymes with foliaceous bracts; leaflets glaucous with white cystoliths ---------- 5. *O. dombeii*
    cc. Cymes with linear, small bracts; leaves green or more or less violaceous.
      d. Cymes long branched, 10–40-flowered; capsule globose -- 9. *O. microcarpa*
      dd. Cymes umbelliform, 3–7(–11–15)-flowered; capsule ovoid or oblong ---------- 7. *O. frutescens* ssp. *angustifolia*
aa. Leaves 3–4-foliolate, digitate.
  e. Roots fibrous or thickened; stems aerial or rhizomatous; sepals without calli at the apex.
    f. Stem aerial, erect or rooting; flowers yellow, sometimes violaceous veined.
      g. Liana; leaves exstipulate, the leaflets ovate ---------- 10. *O. rhombifolia*

gg. Herbs; leaves with stipules connate to the petiole, the leaflets commonly obovate with the apex incised.
h. Stipules truncate or narrowed towards the apex; capsules oblong or cylindric covered with hairs (rarely glabrate).
i. Stems decumbent or erect.
j. Petals light yellow, translucid; leaflets green, the lobules ascendent; calyx to 1/5–1/4 of the capsule length ---------- 3c. *O. corniculata* ssp. *corniculata*
jj. Petals bright yellow, orange or pinkish outside; leaflets glaucous, the lobules more or less divergent; calyx to 1/4–1/3 of the capsule length ---- 3a. *O. corniculata* ssp. *albicans*
ii. Stems filiform, creeping.
k. Stem greenish to violaceous, dark green when dry; capsule cylindric, calyx to 1/5–1/4 its length, slightly retrorse-pubescent to glabrous -- 3b. *O. corniculata* var. *atropurpurea*
kk. Stem reddish, decorticating, leaves green; flowers yellow; capsule oblong, calyx to 1/2–2/3 its length, short pubescent ---------- 6. *O. filiformis*
hh. Stipules with free, acute apex; capsules conic, glabrous or with sparse pluricellular hairs ---------- 11. *O. spiralis* ssp. *vulcanicola*
ff. Plants apparently stemless, rhizomatous to 2 cm diam., ligneous, bearing the bases of decayed leaves; flowers pink ---------- 1. *O. articulata*
ee. Bulbs formed by the reduced stem covered with bracts and the stipules connate to the petioles; sepals usually with calli at the apex; flowers pink.
l. Leaflets 3, entire to bilobate.
m. Leaflets subtriangular ---------- 8. *O. latifolia*
mm. Leaflets obovate, incised, the lobes rounded ---- 4. *O. debilis* var. *corymbosa*
ll. Leaflets 4, entire or rarely slightly retuse ---------- 12. *O. tetraphylla*

1. **Oxalis articulata** Savigny in Lamarck, Encycl. 4. 686–687. 1797. TYPE: Uruguay, Montevideo, in pascuis, *Commerson* May 1767 (P-Juss., holotype; P, isotype).

Apparently stemless *herb* to 40 cm; stem ligneous, rhizomatous, brown, dark, more than 15 cm long, to 2 cm diam., tortuose, bearing the scars of the bases of stipules adnate to petioles of decayed leaves; roots tuberous, subligneous, cylindric, knobby or articulate, dark, thick, more than 10 cm long, 25 mm diam., branched, fibrous, to 15 cm long, sometimes with a long branch bearing a tuber at its apex. *Leaves* 3–30-fasciculate; leaflets widely obovate subcuneate or cuneate, 5–30 mm long, 7–45 mm wide, slightly retuse or acute, incised to 1/5 of its length, a purplish basal callus frequently present, the pubescence straight, appressed, uniform, dense on both faces or only below, or shorter and loose; orange calli abundant near the margins, unequal, rarely scattered on the rest of the surface; stipules connate to the petiole, ovate or triangular, 4–16 mm long, 2–6.5 mm wide, narrowed towards the apex, the hairs appressed ascendent, ciliate; petioles ascendent, 13–30 cm long, densely appressed pubescent to glabrate with short appressed hairs; petiolule ca. ½ mm long, thick, densely pilose. *Inflorescences* of umbelliform simple cymes, 2–5-flowered, bifid, asymmetric, multiflowered with up to 20 flowers or of bifid cymes composed of umbelliform cymes; peduncles taller than the foliage (2.5–40 cm) the pubescence similar to that of the petioles; bracts 2–3 mm long; bracteole 0.5–1(–2) mm long, situated at the base of the inflorescence, oblong or linear, appressed-pilose with 1–2 orange calli at the apex; pedicels long filiform, 1–5.5 cm long, articulate near the base. *Flowers* with the sepals linear-elliptic to linear 2.5–6.5 mm long, 1–2 mm wide, acute, the internal sepal obtuse, often with 3–4 unequal calli, densely appressed-pubescent,

the hairs straight; petals violaceous, obovate-oblong, clawed, connate near the middle, 2–3 times the length of the sepals, the areas exposed in bud covered with white sericeous appressed hairs; stamens with linear filaments, basally broad and abruptly narrowed about the middle, the longer stamens 3.5 mm long, pubescent, the shorter stamens 2 mm long, glabrous, connate to about ⅔, the anthers ovoid; pistils macro-, meso- and microstylous, ca. 5.5 mm long, the ovary pilose at least at the apex and back of the carpels, carpels 4–8-ovuled, the styles densely pilose, the stigma small, capitate. *Capsule* cylindric or oblong, acute, 8–11 mm long, the calyx to ½ of its length, densely ascending appressed pubescent overall or only at the apex of the carpels, the carpels 4–8-seeded; seeds light brownish, ovoid or ellipsoid, acute at both ends, 1–1.25 mm long, 8–9-ribbed in zig-zag, transversally striate with 4–8 deep pits.

Originally from Uruguay, extreme southern Brazil, and some localities of Buenos Aires (Argentina), this species is introduced and cultivated in other American countries and in the Old World. It may escape and become naturalized.

CHIRIQUÍ: Bambito, escaped from cultivation, roadside, *Croat 15882* (MO).

2. **Oxalis barrelieri** L., Sp. Pl. ed. 2. 1763. TYPE: Barrelier, Plant. Rar. Tab. *1139*.

Acetosella barrelieri (L.) Kuntze, Rev. Gen. Pl. 1: 90, 92. 1891.
Lotoxalis barrelieri (L.) Small, N. Amer. Fl. 25(1): 49. 1907.

Erect *herb* or *shrub* to 1 m tall, pubescent; stems green or violaceous, pubescence white or yellowish hirsute, in part retrorse, the apex finely pubescent; internodes to 8 cm long, sometimes almost obsolete resulting in subopposite leaves, hairs at the insertion of the petioles straight; roots fibrous, branched; petioles ascendent, to 4 cm long, canaliculate, enlarged to the base, the margin of the groove ciliate; rachis to 15 cm long pubescent; petiolule fleshy, ca. 1 mm long, pilose. *Leaves* with leaflets varying in shape on the same plant, suborbicular, oblong, ovate to elliptic, 10–55 mm long, 8–25 mm wide, obtuse, seldom acute, the base acute, roundish or subpeltate, asymmetric, discolorous, glaucous above, hairs irregularly scattered, below caducous, the margin or only the base ciliate. *Inflorescences* of cymes taller than the foliage loosely 1–11(–30)-flowered; peduncles to 6.5 cm long, pubescent, bifid with branches to 3 cm long; bracts reddish, lanceolate or triangular, acuminate, ca. 2 mm long, pilose; pedicels to 2.5 mm long, articulate near the base; bracteoles smaller, appressed to the pedicel. *Flowers* with the sepals light green, sometimes red-veined, 3–3.5 mm long, 1–1.5 mm wide, linear to ovate or oblong, acute, mucronate, pubescent, the margin hyaline; petals white or yellowish at the throat and base, the limb pink, obovate-subspatulate, clawed, 7–9 mm long, 3.5 mm wide, slightly notched; longer stamens ca. 3 mm long, pubescent or glabrous, ligulate about the middle, the shorter stamens 1.5–2 mm long, glabrous; pistil 3.5–4 mm long, the ovary ovoid, glabrous, the carpels 3–4-ovuled, the styles pubescent, the stigma widened, bifid, subcapitate, papillose. *Capsule* ovoid 7–9 mm long; acute, rarely oblong, glabrous, membranous, calyx to ½ its length, the carpels (2–)3(–4)-seeded, inside setose pubescent; seeds brownish, ovoid-compressed, apiculate, 1.5–2 mm long, 8-ribbed in zig-zag, deeply transversally striate, finely tuberculate at the intersections.

This species occurs in tropical and subtropical America. It is introduced into some tropical places of the Old World.

BOCAS DEL TORO: Road to "Bomba" Almirante, *Blum 1316* (MO). Ojo de Agua, ca. 7 km W of Almirante, 190–220 m, *Croat 38149* (MO). Near Milla 7.5, *Croat & Porter 16284*; Milla 10, *16344*; Milla 7.5 *16455*; Milla 5, *16498* (all MO). Cerro Jefe, in cafetal, *D'Arcy 3968* (MO, P). Changuinola, 0–100 m, *D'Arcy 11168* (MO). Santa Rita Ridge, *Lewis et al. 5245* (MO, P). Runway at Bocas, *Lazor 2439* (MO). Zigla Road, junction of Changuinola and Tuibe Rivers, *Lazor et al. 2512* (MO). CHIRIQUÍ: Between Cerro Punta and Bajo Grande, *Croat & Porter 16095* (MO). Volcán Chiriquí, Aguacatal 2000 m, *Killip 3578* (F). COLÓN: Santa Rita Ridge, 7 mi from Transisthmian highway, 650 ft, *Wilbur 15034* (MO). Without locality: *Seemann* (BM, K).

3. **Oxalis corniculata** L., Sp. Pl. 435. 1753. NEOTYPE: Cult. hort. Uppsal. herb. Thunb. 11084 (UPS).

3a. **Oxalis corniculata** L. ssp. **albicans** (H.B.K.) Lourt., Phytologia 42: 137. 1979.

O. albicans H.B.K., Nov. Gen. Sp. Pl. 5: 244. 1821. TYPE: Mexico, *Bonpland & Humboldt 4071* (P, holotype; B, isotypes).

Herb to 40 cm; stems branched at the base, prostrate or decumbent, rarely erect, pubescence whitish or yellowish to rusty, ascending or appressed to subhirsute, curved, sometimes dense; root often ligneous, turnip-shaped, thick, more than 30 cm long, branched. *Leaves* pseudoverticillate, subopposite or alternate; leaflets greenish, glaucous, largely obovate-cuneate, generally wider than long, incised up $^1/_5$–$^1/_3(-^1/_2)$ of the length, the lobes divergent, the lateral leaflets asymmetric, the margin often violaceous (conspicuous in dried specimens), the pubescence varied, appressed to hirsute-ciliate, commonly glabrous above; petioles ascendent, pilose; petiolules fleshy, violaceous. *Inflorescences* ascendent, 1–2(–3)-flowered cymes; generally shorter than the foliage, appressed-pubescent; peduncle pilose, to 5 cm long; pedicels appressed-pubescent, longer in fruit, generally the same length or shorter than the fruit. *Flowers* with sepals elliptic, oblong, commonly greenish-violaceous, uneven, the outer sepals pubescent, the others glabrate; petals yellow striate with red outside, pinkish or salmon inside (*fide coll.*) the border villous (observed in buds); pistils mostly mesostylous, some pistils about as long as the longer stamens, a few microstylous. *Capsules* cylindric, acute, the calyx to ¼–⅓ its length, the styles short.

The remaining characters are the same as the ssp. *corniculata*.

This subspecies occurs in Western United States, Mexico, Guatemala, Honduras and Panama.

CHIRIQUÍ: Río Chiriquí Viejo across from town of Cerro Punta, 6000 ft, *D'Arcy 6575* (MO, P). La Popa, above Boquete, 1500–2500 m, *D'Arcy 10929* (MO). Paseo Respingo, 8400 ft, *D'Arcy & Hammel 12888* (MO). Cerro Punta, 6000 ft, *Tyson 5792* (MO).

3b. **Oxalis corniculata** var. **atropurpurea** Planchon in van Houtte, Fl. Serres 12: 47–48, *t. 205*. 1857. TYPE: Planchon's plate.

O. corniculata L. var. *viscidula* Wiegand, Rhodora 27: 117, 121. 1925. TYPE: Massachusetts, *Terry* (GH).

Small *herbs*; roots deep, fibrous, profusely branched; stems, stipules and leaves violaceous. *Flowers* with the sepals green or somewhat violaceous; pistil

micro- or macrostylous, mostly near the same length as the longer stamens. *Capsule* slightly pubescent to glabrous.

This variety, of horticultural origin from Europe, is easily recognized in the living state. It is found in gardens, greenhouses and often escapes. It is not weedy.

CANAL ZONE: Salamanca Hydrological Station, Río Pequení, 80 m, *Woodson et al. 1622* (GH).

3c. **Oxalis corniculata** L. ssp. **corniculata.**

Prostrate *herb*, many branched, hirsute; stems to 50 cm long, branched, the tips ascending; internodes variable in length, roots fibrous. *Leaves* sometimes in long petiolate fascicles; leaflets obovate, cuneate, 4–20 mm long, 7.5–20 mm wide, widely incised up to 1/6 × 1/3 of the length, the lobes roundish, obtuse, above glabrous, pubescent below (often only one half), appressed-ciliate; petioles to 7 times the length of the blade; stipules 0.8–3 mm long, 1–3 mm wide, truncate, hirsute-ciliate. *Inflorescences* of umbelliform 2–7-flowered cymes; peduncles to 21 cm long, ascending, loosely pilose; the bracts linear-triangular 0.5–3 mm long, longer in fruit; bracteoles smaller, linear, ciliate; pedicels 4–15 mm long in fruit and deflexed; sepals linear or narrowly ovate, acute 2.5–5.5 mm long, 4–15 mm wide, greenish or violaceous, sparingly pubescent; petals yellow, oblong-subspatulate, about twice as long as the sepals, 5–11 mm long, 1–2.5 mm wide; stamens glabrous, the longer stamens ca. 6 mm long, the shorter stamens ca. 4 mm long, connate up to about ⅓; pistils micro-, meso-, and macrostylous to 8 mm long; the ovary oblong, acute, retrorse-pubescent, the styles appressed retrorse pubescent, the stigma 2-lobed, papillose, the carpels 4–15-ovuled. *Capsule* cylindric, acute, 5–20 mm long, 1–3 mm diam., retrorse pubescent with pluricellular glandular hairs, exceptionally glabrous, the carpels commonly 8–10(–14)-seeded, pubescent, pubescent inside, the calyx to 1/4–1/5 the capsule length, the styles long connate, straight; seed reddish-brown, ca. 1 mm long, ovoid, apiculate, flattened, 6-ribbed, transversally striate and finely tuberculate at the intersections.

This species is distributed worldwide, originating in the European Mediterranean region. It is well adapted to all climates, requiring only some humidity, and reaching its largest forms in cultivated lands. It can become weedy and hybridize with autochthonous species of the same section.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 393* (F, US). CANAL ZONE: Chagres, between Gamboa and Alahuela, 30–60 m, *Allen 975* (MO). Balboa, *Standley 28561* (US). Río Pequení, Salamanca Hydrographic Station, 80 m, *Woodson et al. 1622* (MO, NA, NY). CHIRIQUÍ: Río Chiriquí Viejo "New Switzerland," 1800–2000 m, *Allen 1403* (GH, MO). Boquete, Finca Collins, *Blum & Dwyer 2581* (MO). Volcán, Escuela San Benito, *Croat 10416* (MO). N of Cerro Punta, *Croat 10484* (MO, P). Cerro Punta, IDAAN water tank, 700 m, *Croat 26551* (MO, P). 4 mi above Boquete on road to Volcán Barú, 1475 m, *Croat 34855* (MO). Between Boquete and Monte Rey, *Croat & Porter 15627, 15732* (both MO). Between Cerro Punta and Bajo Grande, *Croat & Porter 15994* (MO, P, US). Bambito, 5500 ft, *D'Arcy 5341* (MO). Río Chiquero, *D'Arcy 11006* (MO). La Popa, Boquete, *D'Arcy & D'Arcy 6370* (MO, P). Boquete, 4200 ft, *D'Arcy & D'Arcy 6458* (MO, P). Cerro Respingo, Cerro Punta, 8400 ft, *D'Arcy & D'Arcy 6551* (MO, P). Cerro Horqueta, 1500 m, *Duke et al. 13657* (MO). Boquete, Finca Collins, *Ebinger 715* (F, MO, NY). Las Cumbres near Cerro Punta, 7200 ft, *Hammel 6952* (MO). Boquete, 3300–4200 ft, *Lewis et al. 347* (GH, MO, UC, US); *Maurice 685* (US). Finca Collins, "El Velo," 6150 ft, *Stern et al. 1967* (MO). Boquete, 4200 ft, *Sucre 194* (RB). Nueva California, 4000 ft, *Tyson 5709* (MO). Cerro Punta, 6000 ft, *Tyson 5793* (MO). Volcán de Chiriquí, Casita Alta, 1500–2000 m, *Woodson et al. 990* (MO, NA, NY). Finca Lérida, *Woodson & Schery 310* (MO). COCLÉ: Club Campestre, El Valle de Antón, 700 m, *Duke 13237* (MO).

4. **Oxalis debilis** H.B.K., Nov. Gen. Sp. Pl. 5: 236. *t. 466*. 1821.

4a. **Oxalis debilis** H.B.K. var. **corymbosa** (DC.) Lourt., comb. nov.

O. corymbosa DC., Prodr. 1. 696. 1824. LECTOTYPE: Insula Borbona (G-DC).
O. martiana Zuccarini, Denksch. Akad. Wiss. Muench. 9: 144. 1825.
O. urbica St. Hil., Fl. Bras. Mer. 1: 100. 1825.
O. bipunctata Graham ex Hook., Bot. Mag. 54: *t. 2781*. 1827. TYPE: cult. Roy. Bot. Gard. Edinburgh, seed from Brazil, Rio de Janeiro, sent by Harris to *Graham* April 1827 (E).
O. violacea auct. non L.
Acetosella martiana (Zucc.) Kuntze, Rev. Gen. Pl. 1: 90. 1891.
Ionoxalis martiana (Zucc.) Small, Fl. S.E. U.S. 665. 1903.

Apparently stemless *herb*; root vertical, thick with fibrous branches; bulb globose, ovoid or oblong, 1–2 cm long, 3 cm diam., formed of nutritious scales and numerous bulbils covered by protective scales and the stipules connate to the petioles; scales brown, ovate, scarious 7–11 mm long, 3–5 mm wide often covered with rigid, acuminate, orange calli, the margin hyaline, ciliate with long smooth hairs, to 4 mm long, rusty, the 3 longitudinal nerves connate below the apex. *Leaves* with leaflets suborbicular or broadly obovate, 1.25–5.5 cm long, 1.5–4.7 cm wide, incised up to 1/9–1/5 of the length, cuneate, the hairs short, sparse on both faces or only beneath, with punctiform minute, translucid orange or violaceous oxalate "crystals" scattered on the blade, more visible below, frequently a larger and more prominent row along the border; petioles to 30 cm long with sparse hairs, rarely densely pubescent; petiolules 0.5–1 mm long, fleshy, pilose; stipules completely connate, 13 mm long, 2 mm wide, scarious, brown, linear, 3-nerved, the nerves salient, convergent just below the apex, sometimes with 2 additional thinner lateral nerves running with the central nerve into the petiole, the borders ciliate as the scales; bulbils covered by similar smaller scales. *Inflorescences* bifid cymes, the branches unequal, sometimes twice bifid, generally asymmetric or umbelliform, loosely 3–15-flowered; peduncles little shorter to longer than the foliage, to 45 cm long, similar to the petioles; bracts opposite, hyaline, largely ovate or rhombic, 2–5 mm long, 2–2.5 mm wide; bracteoles inserted near the base of the pedicel on the pilose articulation, 1–3 mm wide, 0.25–1 mm long, bracts and bracteoles with calli; pedicels 4–20 mm long, similar to the peduncle, articulate 1–3 mm from the insertion. *Flowers* with the sepals greenish, the margin hyaline, linear to elliptic, 4–7 mm long, 0.75–1.5 mm wide, subequal, obtuse or acute, the apex ciliate, the calli orange, linear or enlarged towards the apex, parallel or oblique, rarely convergent or divided giving 3 or 4 calli; petals pinkish, salmon or red-violet, sometimes with inconspicuous short appressed hairs outside, obovate, clawed, 2–3 times the length of the sepals; stamen filaments enlarged towards the base, the longer stamens 4.5 mm long, pilose towards the apex and with some short glandular hairs mixed; the shorter stamens ca. 3 mm long, glabrous, connate to 1/3; pistil macro- and mesostylous, rarely microstylous, 7.5 mm long, with scattered ascendent hairs and short glandular hairs, the stigma bifid, subcapitate, the ovary glabrous, the carpels 2–12-ovuled. *Capsules* (immature) cylindric, thin, glabrous to 17 mm long, the calyx to 1/4–1/3 as long as the capsule, styles ca. 2 mm long, the carpels short pilose inside, 3–10-seeded; seeds (immature) brownish, ovoid, flattened, 12-ribbed in zig-zag and 12 transversal striae.

This is a South American species widespread in the whole world, occasionally fruiting but reproducing through abundant bulbils developing simultaneously.

BOCAS DEL TORO: Bocas, border mangrove swamp, *Lazor et al. 2428* (MO). CHIRIQUÍ: Boquete, 4500 ft, *D'Arcy 5446* (MO); *D'Aarcy & D'Arcy 6460* (MO). 3 mi N of Boquete, 3300–4200 ft, *Lewis et al. 340* (MO). Alto Lino, *Maurice 873* (US).

5. **Oxalis dombeii** St. Hil., Fl. Bras. Mer. 1: 111. 1825. TYPE: Perú, *Dombey* (P).

O. darienensis Woodson, Ann. Missouri Bot. Gard. 27: 312–313. 1940. TYPE: Panama, *Allen 881* (MO, holotype; GH, NY, P, US, isotypes).
O. barrelieri sensu auct. non L.

Erect *herb* to 60 cm, glabrous or puberulent on younger parts; white cystoliths often present on the leaves, bracts, bracteoles, occasionally on the sepals; pubescence long transparent, sometimes viscous; stem sometimes subligneous at the base, to 6 mm diam. often with glandular hairs, these inconspicuous when lacking secretion; internodes 1.5–4 mm; roots fibrous, branched; rhizome cylindric, slender. *Leaves* alternate, subopposite or pseudoverticillate; leaflets oblong obovate to suborbicular, the lateral leaflets asymmetric, 9–25 mm long, 5–22 mm wide, glabrous or with hairs on the nerves below and fine ciliate, obtuse or retuse, basally subpeltate or barely auriculate; petiole to 4 cm long, canaliculate, often narrowly winged; rachis to 6 mm long. *Inflorescences* of cymes taller than the foliage, loosely 10–25-flowered; peduncle to 6 cm long, bifid with long branches, one branch aborted or shortened; bract and bracteoles overlapping, bracts ca. 3 mm long, bracteoles ca. 1.5–2.5 mm, foliaceous, lanceolate, acuminate, greenish or red-striate, appressed to the rachis, subamplexicaul, pedicels ca. 3 mm long, glabrous, rarely pubescent, articulate near the base. *Flowers* with the sepals greenish, the margins hyaline, ovate and acuminate or oblong 4.5–7 mm long, 1–2 mm wide, glabrous, acute; petals yellow-orange, obovate-subspatulate, 7–13 mm long; stamens longer, ca. 2.5 mm long, pubescent with a thin ligule, acute in the lower half, the shorter stamens ca. 1.25 mm long, glabrous; pistils ca. 3 mm wide, the ovary oblong, the carpels to 10-ovuled, the styles thin, pubescent, the stigma capitate. *Capsule* oblong to ellipsoid, ca. 10 cm long, the calyx to ⅔ of its length, glabrous, the carpels 7–10-seeded, inside densely and finely pubescent; seeds rusty, ca. 1 mm across, subpyriform, 5–6-ribbed in zig-zag, transversally striate and tuberculate at the intersections.

This species occurs on dunes and arid regions, rarely in cultivated fields, of the Pacific coast and Andean slopes of Perú, Ecuador, and Panamá. It also occurs in the Galápagos Archipelago.

DARIÉN: Boca de Cupe, *Allen 881* (MO, NY, P, US). Río Chico, near Yaviza junction with Río Chucunaque, *Burch et al. 1086* (MO). Junction Río Peresenico and Río Pirré, *D'Arcy 5531* (MO, P). 4 mi S of Cañitas, *D'Arcy & D'Arcy 6057* (MO, P). 2–3 mi SE of El Real, *Duke 4858* (MO, P). 10 mi S of El Real on Río Pirré, *Duke 5371* (MO, P). Pigi Vasal, Choco village, *Folsom 4557* (MO). Río Chucunaque, *Larsen 215* (G). Camino de El Real a Río Pino, *Lazor 1550* (MO). Between Caná and Boca de Cupé, near El Real along Río Pirré, *Stern et al. 609* (GH, MO, US). PANAMÁ: Between Río Bayano Dam and Cañitas, *D'Arcy 9395* (MO, P). Near Bayano bridge, *Folsom 3556* (MO).

6. **Oxalis filiformis** H.B.K., Nov. Gen. Sp. Pl. 5: 190, *t. 460*. 1821. TYPE: Colombia, Guaduas, Santa Ana, *Bonpland* (P, holotype; B, P, isotypes).

Xanthoxalis filiformis (H.B.K.) Holub., Folia Geobot. Phytol. Praha 8: 175. 1973.

Creeping *herb* to 10 cm tall, pubescent with fine and whitish or reddish simple and pluricellular hairs, 1.5–2 mm long, mixed; roots fibrous, branched; rhizomes and stems filiform, to more than 50 cm long, reddish, decorticating, hirsute, rooting; internodes 1–5 cm long, the nodes 1-leaved or with fascicles of leaves. *Leaves* with leaflets cordiform or transversely oblong, cuneate, 2–15 mm long, 3–20 mm wide, incised to ¼ of its length, both faces pubescent or above glabrous, glabrescent, ciliate; stipules connate, reddish, enlarged at the apex, 2–3 mm long, 0.75–1.75 mm wide, setose-ciliate, concave. *Inflorescences* of the cymes longer than the foliage, 1-flowered; peduncles 1–7 cm, filiform; bracteoles linear, pilose, 1.5–3 mm long; pedicel 0.5–2.5 cm long. Flowers with the sepals greenish, the margins often violaceous, oblong, 3–5 mm long, 1–2 mm wide, obtuse, the apex densely ciliate, pubescent; petals 2–3.5 times the length of the sepals, rarely with minute glandular hairs scattered on the border and outside; stamens minutely pubescent, the longer stamens to 5.5 mm long, the shorter stamens to 4 mm long, connate to ¼ of its length; pistils all longistylous, 6.5–7.5 mm long, the ovary reddish, carpels with a few short hairs inside, 3–6-ovuled, styles densely pubescent, ca. 5 mm long, slightly connate at the base, the stigma bifid, laciniate, papillose. *Capsule* oblong, 5–12 mm, thick, the calyx to ½–⅔ the capsule length, acute, minutely pubescent, the styles long, free, the carpels 3–6-seeded; seeds reddish-brown ca. 1 mm long, ellipsoid, flattened, acute, 6-ribbed, transversally striate.

This species ranges from Costa Rica along the cordillera to Ecuador, occurring among herbs in prairies and savannas above 1,000 m elevation.

CHIRIQUÍ: 5.4 km del Hato del Volcán en el camino a Las Lagunas, *Correa & Lazor 1479* (MO).

7. **Oxalis frutescens** L., Sp. Pl. 435. 1753.

7a. **Oxalis frutescens** ssp. **angustifolia** (H.B.K.) Lourt., Phytologia 29: 463–471, *f. 3*. 1975.

O. angustifolia H.B.K., Nov. Gen. Sp. Pl. 5: 193. 1821. TYPE: Mexico prope La Venta del Peregrino, *Humboldt & Bonpland 3906* (P, holotype; B, isotype).
O. coccinea Woodson & Schery, Ann. Missouri Bot. Gard. 28: 431. 1941. TYPE: Panamá, *Woodson & Schery 1029* (MO, holotype; NY, US, isotypes).

Hirsute *subshrub* to 40 cm tall or small *shrubs* branched from a ligneous base, the branches ascending, twisted or decumbent; stems with hirsute, fine long, uneven pubescence; roots twisted, often swollen, to 7 mm diam. *Leaves* pseudoverticillate, crowded or the internodes to 5.5 cm long, leaflets green, glaucous or violaceus, the middle one at least twice as long as the laterals, elliptic, subacute or obovate, generally notched, 10–45 mm long, 4–20 mm wide, the lateral leaflets oblong, rarely elliptic, asymmetric, notched, 4–20 mm long, 1.5–10 mm wide; pubescence dense on both faces or above glabrous or glabrescent, some specimens only pubescent on the midrib, ciliate; rachis 0.2–10 mm; petiole 10–40 mm, ascendent, pubescence as on the stems. *Inflorescences* of cymes umbelliform, 2.5 cm, somewhat taller than the foliage, 3–7(–11–15)-flowered; branches shortened ca. 1 cm, 1 often aborted; bracts 1.5 mm and bracteoles ca. 1 mm, linear,

acute; peduncles to 3.5 cm; pedicels 5 mm, pilose, articulate 1 mm from the base. *Flowers* with the sepals elliptic or linear, 3–5.5 mm long, 0.25–1.5 mm wide, acute, mucronate, pilose to glabrous, the interior sepal glabrate, the apex ciliate; petals yellow, 2½–3 times the length of the sepals, obovate, clawed, slightly notched; longer stamens ca. 3 mm long, pilose, the ligule acute near the middle, the shorter stamens ca. 1.5 mm long, connate up to ⅓; pistil 4.5 mm long, pilose, the ovary ovoid, the style pilose, the stigma bifid, capitate. *Capsule* ovoid or oblong, 5–6 mm long, except those with 1-seeded carpels, rarely to 8 mm when carpels 8-seeded, the calyx usually ½ (–$^4/_5$) its length; the carpels ciliate on the back, inside pubescent, rarely glabrous, 1–5-seeded; seeds brownish 1.5–2 mm long, ovoid, apiculate, 8-ribbed in zig-zag with 10–12 transversal deep striae and fine tubercules on the intersections.

This species is frequent in poor sandy, stony soils and savannas and campos from the Texas-Mexican frontier to the northwest of Argentina.

BOCAS DEL TORO: Nievecita, *Woodson & Schery 1029* (MO, NY, US). COCLÉ: Santa Clara beach, *Croat 9587* (MO). 4–6 mi E of Natá, 10–25 m, *Duke 12402* (MO). Penonomé, *Dwyer 2040* (MO); *Ebinger 996* (F, MO). Natá, *Seemann 1227* (K). Río Grande 10 mi E of Natá, *Tyson 5277* (MO). HERRERA: 10 mi S of Ocú, *Tyson et al. 2874* (MO). PANAMÁ: Cerro Jefe, 700 m, *Davidse & D'Arcy 10115* (MO, P). Near Playa Río Mar, 10–100 ft, *Duke 11783* (MO, US), *12408* (MO, NY); *Ebinger 497* (F).

8. **Oxalis latifolia** H.B.K., Nov. Gen. Sp. Pl. 237. *t. 467.* 1821. TYPE: Mexico, Campeche, *Humboldt et Bonpland* (P-HB, holotype; B, isotype).

O. intermedia Richard, Essai Fl. Cuba 315. 1841. TYPE: Cuba, *de la Sagra* (P, holotype; P, isotypes).
O. mauritiana Loddiges, Bot. Cab. 178. *tab. 1780.* 1832. TYPE: Loddiges' plate.
O. lilacina Klotzsch in Otto & Dietrich, Allgem. Gartenzeit. 8: 285. 1840. TYPE: Not found.
O. chiriquensis Woodson, Ann. Missouri Bot. Gard. 24: 190. 1937. TYPE: Panama, *Seibert 222* (MO, holotype; NY, isotype).
O. stylosa Klotzsch ex Knuth in Engler, Pflanzenr. 95(130): 273. 1930. nomen in syn.
O. elegans H.B.K. var. *karwinski* Progel ex Knuth in Engler, Pflanzenr. 95(130): 273. 1930. nomen in syn.
Acetosella violacea (L.) Kuntze ssp. *latifolia* (H.B.K.) Kuntze, Rev. Gen. Pl. 1: 90. 1891.
Ionoxalis latifolia (H.B.K.) Rose, Contr. U.S. Natl. Herb. 10: 113. 1906.
I. intermedia (Richard) Small, N. Amer. Fl. 25(1): 43. 1907.

Apparently stemless *herb*; roots deep, vertical, the branches fibrous; bulbs ovoid or globose to 25 mm long, 20 mm diam., outer scales papyraceous, large, sometimes absent; scales (nutritious) brown, elliptic, acute, narrow, 7–15 mm long, 4–6 mm wide, strongly 3-nerved, 1–2 lateral pairs of nerves thinner, exceptionally yet another shorter lateral pair present; bulbils ovoid, acute, ca. 1 cm, young, protected by several hyaline bracts similar to those described above, smaller. *Leaves* with the leaflets green, violaceous below, triangular, cuneate 10–45 mm long, 20–75 mm wide, the distal margin straight, rarely incised to $^1/_5$–$^1/_4$ the length, short mucronate or broken in a broad, obtuse angle and the lobes divergent, small calli of various shapes often nearby, the distal angles obtuse, glabrous or sparse hairy below on the nerves or rarely overall; the margin with some cilia; petioles ascendent 5–15 cm long, glabrous or somewhat pilose; petiolules fleshy, ca. 1 mm long, pilose; stipules connate to the petioles, hyaline-papyraceous, rusty-brown, ovate or rectangular, the apex auriculate, ciliate with long, viscid rusty hairs, the margins glandular, 3 prominent nerves arising from

the base and with orange calli converging just below the apex, lateral pairs generally 2, thinner and shorter, not reaching the apex: the inner pair sometimes bifurcate. *Inflorescences* umbelliform cymes commonly twice as long as the foliage, to 30 cm long, loosely 5–20-flowered; peduncles 10–25 cm long, similar to the petioles; bracts ca. 2 mm long, 2 mm wide, and bracteoles ca. 1 mm, all at the base of the inflorescence, hyaline, broadly ovate to rhombic or elliptic, acute, clasping the peduncle or the pedicel, ciliate, 1-nerved, softly crenate; pedicels thin, 14–20 mm long. *Flowers* with the sepals green, the margin hyaline, glabrous, uneven, linear-elliptic to oblong, narrowed to the apex, obtuse or subacute, 3–5 mm long, 0.5–1.5 mm wide, with orange or violaceous calli at the apex, 0.3–0.8 mm long, 2-lobate, convergent at the top end, sometimes entire, ovate, the base irregular; petals white at the base, pink to purplish at the limb, 2.5–3.5 times the length of the calyx, obovate, spathulate, clawed; stamens with filaments enlarged towards the base, pilose on the upper half, the longer stamens ca. 4 mm long with an obtuse sometimes inconspicuous ligule near the middle; the shorter stamens ca. 3 mm long, connate ¼ way up; pistils micro- or rarely macrostylous, 4.5–5.5 mm long, the ovary ovoid, glabrous, the carpels 4–8-ovuled, the styles fine, glabrous, the stigma bifid, papillose. *Capsule* oblong, acute, glabrous 4–8.5 mm long, the calyx to ¼–½ its length, the styles 1.5–2 mm long, the carpels 4–8-seeded, the hairs inside sometimes inconspicuous; seeds brownish, ellipsoid, slightly flattened, ca. 1–1.1 mm long, 8–9-ribbed in zig-zag with 12–13 transversal striae.

This species occurs in Mexico, Costa Rica, the Antilles, and the Andes of South America up to 1,800 m elevation and south to Bolivia. It is introduced to the southeast of Brazil, Europe, Africa, Australia, and New Zealand.

CHIRIQUÍ: Volcán, Escuela San Benito, *Croat 10415* (MO). Boquete, 3800 ft, *Davidson 703* (F, GH, MO). Volcán Barú, 8000 ft, *Hammel 2918* (MO). Valley of upper Río Chiriquí Viejo, Monte Lirio, 1300–1900 m, *Seibert 222* (MO, NY). Chiriquí Viejo valley, *White 102* (MO). Boquete, 1200–1500 m, *Woodson & Schery 777* (MO).

9. **Oxalis microcarpa** Benth., Pl. Hartweg. 115. 1839. TYPE: Ecuador, prope Zamboronton, *Hartweg* III . . . (K).

O. Guayaquil Turcz., Bull. Soc. Imp. Moscou 31: 427. 1858. TYPE: Ecuador, banks of Guayaquil River, *Jameson 557* (K, Holotype; BM, G, W, isotypes).

Herb or *subshrub* to 1.20 m; stem erect, green or brown, the pubescence fine, curved, generally retrorse, long, hirsute, whitish or yellowish; internodes 2.5–5.5 mm, roots fibrous, branched; rhizome thin, to 4 mm diam. *Leaves* alternate to subopposite; leaflets ovate, elliptic or subrhombic unequal, 10–38 mm long, 16–20 mm wide, obtuse or subacute basally cuneate or slightly cordate, the pubescence subappressed, even, scattered, above denser, glabrescent beneath, unevenly ciliate; petiole filiform, ascendent to 4 cm long, pubescent, canaliculate, enlarged to the base, with hairs at its insertion. The *inflorescences* of bifid cymes, 10–12(–40)-flowered, peduncles filiform, pubescent as on the petioles up to 6 cm long, branches longer in the fruit, to 6 cm; bracts linear, acuminate, hirsute, 1–1.5 mm; pedicels articulate near the base 2–3 mm long. *Flowers* with the sepals green, ovate or elliptic, acuminate, 3 mm long, 0.75–1 mm wide, acute or rarely

subacute, the margin hyaline, often apically ciliate, glabrous; petals yellow, obovate-subspathulate 6–7 mm long; longer stamens ca. 2.5 cm long, ligulate under the middle, glabrous or pubescent; the shorter stamens 1.5–2 mm long, glabrous; pistil about equalling the longer stamens; styles pilose, the stigma enlarged, 2-lobulate, capitate, the carpels 1–2-ovuled, glabrous. *Capsule* subglobose ca. 3 mm long, glabrous, about equalling calyx; the carpels membranous, thin, glabrous inside, 1-seeded; seeds brownish ca. 1.5 mm long, 8-ribbed in zigzag, deeply transversally striate with small tubercules on the intersections.

This species occurs along the Pacific coast and western slopes of the cordillera from Ecuador to Mexico.

CANAL ZONE: Quebrada La Palma and Cañon of Río Chagres, 70–80 m, *Dodge & Allen 17337* (G). Río Indio, 70–100 m, *Dodge & Allen 17381* (BR, G, K, MO, P). Chagres, 1 mi above Madden Lake, *Duke 4475* (MO, P). Madden Dam, *Ebinger 876* (US). Chagres, *Fendler 25* (K, US), *26* (GH, MO). Fort Sherman between Chagres Batteries and Fort San Lorenzo, *Maxon & Valentine 6991* (GH, NY, US). Punta de Garachiné, *Seemann 1063* (K). Las Cascadas Plantation near Summit, *Standley 29618* (US). Río Boquerón, *Steyermark & Allen 17230* (BR, G, MO, P, S, US). Quebrada La Palma and Cañon Hill, *Woodson et al. 720* (F, GH, MO). DARIÉN: Río Chico, near Yaviza at junction with Río Chucunaque, *Burch et al. 1192* (MO). Mannené, *Kirkbride & Bristan 1572, 1612* (both MO). Río Tuquesa, Camp Charco Peje of Tuquesa Mining Co., 250 m, *Mori 7042* (MO). PANAMÁ: Río Cañita, near Jenine, *Duke 3838* (MO). Junction Río Pacora and Río Corso, 450 m, *Duke 11955* (P). Tortí Arriba, *Folsom 5163* (MO). La Chorrera, *Lewis et al. 5198* (MO). Río Tapia, *Standley 28075* (US). VERAGUAS: Piria, 120 m, *Duke 14359* (MO).

10. **Oxalis rhombifolia** Jacq., Oxalis Monogr. 22. *tab. 2.* 1794. TYPE: Venezuela, Caracas, Bredemeyer ex herb. Jacquin (W).

O. maxonii Standley, J. Wash. Acad. 17: 311–2. 1927. TYPE: Panamá, *Maxon 4996* (US, holotype; F, G, GH, US, isotypes).

O. rhombifolia Jacq. var. *pubescens* Pittier, Trab. Mus. Com. Venezuela 7: 310. 1930. TYPE: not seen.

Acetosella rhombifolia (Jacq.) Kuntze, Rev. Gen. Pl. 1: 93. 1891.

Climbing subligneous *shrub* to 6 m; pubescence yellow to rusty, long hirsute; stems profusely branched, brownish, new branches hirsute, glabrescent; internodes 5–40 cm long, shortened at the apex and on the small lateral aborted branches which bear a fascicle of leaves. *Leaflets* elliptic to rhombiform or rhombic ovate, 14–45 mm long, 10–26 mm wide, obtuse or subacute, the middle leaflet longer, the lateral leaflets somewhat asymmetric, both faces pubescent, glabrescent above, ciliate; petiolules ca. 1 mm thick, pubescent; petioles filiform, 1½–2 times the length of the blades, pubescent, swollen at the base. *Inflorescences* with cymes bifid, loosely 3–5-flowered, pubescent; peduncles to 5 cm long; bracts 3–7 mm long; bracteoles 1.5–2 mm long, linear, narrow, pubescent; pedicels 3–5 mm long, articulate near the base. *Flowers* with the sepals oblong or linear oblong, 4–5.5 mm long, 1.5–2 mm wide, obtuse, densely ciliate at the tip; petals yellow, obovate, subspathulate, 10–17 mm long, the longer stamens 5–8 mm long, hirsute, the shorter stamens ca. 3 mm long, enlarged towards the base, connate to ⅓; pistils 7–10 mm long, macro-, meso-, and microstylous, the styles hirsute, the stigma bifid, enlarged, papillose, the ovary densely pubescent, the carpels 3-ovuled. *Capsule* oblong or ovoid 7–9 mm long, densely tomentose, the calyx ½ as long as the capsule, the carpels setose inside, 2–3-seeded; seed dark colored ca. 2.25 mm long, semiovoid, flattened, 13–14-ribbed, the ribs tuberculate.

FIGURE 4. *Oxalis spiralis* ssp. *vulvanicola* (D. Sm.) Lourt. Habit (×½). [After *Nee 10001*.]

This species occurs from Mexico to Venezuela and Colombia in humid and shadowed situations of the forest.

CHIRIQUÍ: Bajo Mono, 4500 ft, *D'Arcy 11062* (MO, P); *Davidson 495* (F, MO). Without locality, *Duke et al. 13631* (MO). Horqueta, Griffen's trail, 1700 m, *Killip 3527* (US). Bajo Lino, *Maurice 888* (COL, US). Boquete, 1000–1300 m, *Maxon 4996* (F, G, GH, US); *Pittier 2970* (F, US). Quiel Road 12.2 km above Boquete, *Proctor 31847* (IJ). Quebrada Horqueta, 1600 m, *Webster 10705* (F). Between Bajo Quiel and Bajo Mono, ca. 6 mi N of Boquete, 1450 m, *Wilbur et al. 12014* (MO). Bajo Mono, mouth of Quebrada Chiquero along Río Caldera, 1500–2000 m, *Woodson et al. 1011* (GH, NA, MO); *Woodson & Schery 526* (MO).

11. **Oxalis spiralis** R. & P. ex Don, Gen. Syst. 1: 755. 1831.

11a. **Oxalis spiralis** ssp. **vulcanicola** (D. Sm.) Lourt., comb. nov.

O. vulcanicola D. Sm., Bot. Gaz. 23: 241. 1897. TYPE: Costa Rica, Montée au flanc SE du Poás, 1900 m, *Pittier 869* (US).
Xanthoxalis vulcanicola (D. Sm.) Small, N. Amer. Fl. 25(1): 55. 1907.
X. "*siliquosa*" J. Roy. Hortic. Soc. 85: 371. 1960, nom. inval. sine diag. lat.

Decumbent or trailing *herb* (small young plants erect), finely pubescent with yellow or reddish hairs, sometimes glabrate, succulent, to 1.5 m, branched; internodes 2–10 cm long. *Leaves* with leaflets oblong to suborbicular, cuneate, widely notched, mucronate, 10–35 mm long, 8–23 mm wide, dark green above, violaceous below, the midrib pubescent below, lateral leaflets asymmetric; petioles violaceous 2–4 cm long; stipules reddish, hyaline, connate except at the

narrow and acute apex, 2.5–5.5 mm long, slightly pubescent. *Inflorescences* of lateral, axillary and terminal cymes taller than the foliage, (1–)2–17-flowered; peduncles to 12 cm; bracts 1.5–4 mm long and bracteoles ca. 1 mm long, linear, pubescent; pedicels to 16 mm long, articulate near the base. *Flowers* with the sepals linear, 5–7 mm long, 0.75–1.5 mm wide, narrowed towards the apex, acute, glabrous or somewhat pubescent; petals yellow, obovate, cuneate 12–18 mm long, violaceous-veined; stamens with filaments short, glabrous, the longer stamens ca. 6 mm long with an obtuse ligule near the middle; the shorter stamens ca. 2 mm long, connate halfway up; pistils micro-, meso-, and macrostylous, 6 mm long; the ovary glabrous, the styles very thin, the stigma bifid, capitate papillose. *Capsule* ellipsoid, acute ca. 6 mm long, glabrous, the calyx the same length, the carpels 3–4-seeded; seeds oblong ca. 1 mm long, dark violaceous.

Oxalis spiralis ssp. *vulcanicola* is a common plant of the forest in the subparamo and cloudy forest of Central America south to Panama, occurring in volcanic regions up to 3,500 m elevation. It is cultivated as an ornamental in greenhouses, usually in hanging pots, for the beauty of its profusely branched red stems and its abundant bright yellow flowers. Grown in this way the branches are pendulous.

CHIRIQUÍ: Cerro Punta to headwaters of Río Caldera, 2250–2500 m, *Allen 1425* (F, GH, MO, US). NW of Boquete, Río Caldera, 6400 ft, *Averett 1105* (MO, P). Cerro Punta a Las Nubes, 6000 ft, *Correa 1341* (MO). Cerro Punta, *Croat 10451* (MO, P, US). 2.7 mi NW of Río Chiriquí Viejo, 2200 m, *Croat 22362* (MO, P). W of Cerro Punta, 2200 m, *Croat 22363* (MO). Road to Volcán Barú, 12 mi above Boquete, *Croat 34867* (MO). Alto Respingo, 2800 m, *D'Arcy 9959* (MO, P). Potrero Muleto to summit of Volcán Barú, *D'Arcy 10155* (MO, P). Alto Respingo, above Cerro Punta, 3000 m, *D'Arcy 10731* (MO). La Popa above Boquete, 1500–2500 m, *D'Arcy 10854* (MO, P). La Nevera, below summit of El Barú, 10,400–10,500 ft, *D'Arcy & Hammel 12447* (MO, P). El Volcán SE of La Nevera, 10,000 ft, *D'Arcy & Hammel 12512* (MO). Between Guadalupe and Paso Respingo, 8100 ft, *D'Arcy & Hammel 12836* (MO, P). Ridge above Alta Boquete, 7400–8000 ft, *D'Arcy et al. 13147* (MO). Volcán Barú, above Boquete, 3100 m, *Davidse & D'Arcy 10270* (MO, P). Boquete, Bajo Choro, 6000 ft, *Davidson 418* (F, GH, MO, US). Las Nubes region 7 km NW of Cerro Punta, 7200 ft, *Hammel 1383* (MO). Volcán Barú, E slope, 9000–10,000 ft, *Hammel 2812* (MO). Volcán Barú, E slope W of Finca Yen, 8000 ft, *Hammel et al. 6470* (MO). Cerro Punta, roadside W of Paso Respingo, 8200 ft, *Hammel et al. 6648* (MO). Alto Pineda, *Hammel et al. 6990* (MO). Chiriquí Volcano, 2300 m, *Killip 3578* (F, US). Above El Potrero camp, Chiriquí Volcano, 2890–3025 m, *Maxon 5318* (F, US). Cerro Punta, *Mori & Kallunki 5653* (MO, P). Bajo Grande, 1–3 km from town of Cerro Punta, 2000–2200 m, *Nee 10001* (MO, P, US). Boquete, 10,000 ft, *Terry 1342* (F, GH, MO, US). Quebrada Grande from Bajo Grande to Paso de Respingo, 2100–2400 m, *Wilbur et al. 15118* (MO). Potrero Muleto to summit, Volcán de Chiriquí, 3500–4000 m, *Woodson & Schery 467a* (MO).

12. **Oxalis tetraphylla** Cav., Icones 3: 19–20. *t. 237*. 1794. TYPE: Cavanilles' plate.

O. deppei Loddiges, Bot. Cab. 15. *t. 1500*. 1828. TYPE: Loddiges' plate.
O. esculenta Dietrich in Otto & Dietrich, Allgem. Gartenz. 3: 388. 1835. TYPE: not found.
O. zonata Lejeune, Bull. Acad. Sci. Bruxelles 2: 334. 1836. TYPE: Lejeune's plate.
O. pseudotetraphylla Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 316. 1919.
O. mucronata (Rose) Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 315. 1919.
O. hayi Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 316. 1919.
O. scopulorum (Rose) Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 391. 1919.
O. cuernavacana (Rose) Knuth, Notizbl. Bot. Gart. Berlin-Dahlem 7: 291. 1919.
O. quadrifolia Knuth in Engler, Pflanzenr. 95(4). 130: 288. 1930, nom. inval. in synon.
Acetosella tetraphylla (Cav.) Kuntze, Rev. Gen. Pl. 1: 92. 1891.
A. deppei (Lodd.) Kuntze, Rev. Gen. Pl. 1: 92. 1891.
Ionoxalis tetraphylla (Cav.) Rose, Contr. U.S. Natl. Herb. 10: 115. 1906.
I. deppei (Lodd.) Small, N. Amer. Fl. 25(1): 32. 1907.

I. scopulorum Rose in Small, Fl. S.E. U.S. 666. 1903.
I. divaricata Small, Fl. S.E. U.S. 666. 1903.
I. mucronata Rose in Small, N. Amer. Fl. 25(1): 40. 1907.

Apparently stemless *herb*; roots vertical, fasciculate, turnip-like or cylindric, sometimes with profuse and very long fibrous branches; bulb globose or ovoid to 4 cm long, 3 cm diam., formed by the reduced conic or discoid stem, the scales and the stipules connate to the petioles; bulbils distant on thin stolons, rarely observed in present material; outer scales scarious, brownish or with hyaline margin, the outermost row linear, 3–5-nerved, 4–18 mm long, 1–12 mm wide, sharp, sometimes absent or lost in collecting, the other ovate or largely ovate-triangular, (5–)7–14-nerved, 15–17 mm long, 5–8 mm wide, abruptly acute; inner nutritious scales yellow, thick rigid, flat-convex or subconcave, 3–5(–7)-nerved, the nerves broad, prominent, 3–7 mm long, 2–7 mm wide; stipules hyaline or scarious, whitish or reddish-brown, connate, broad at the bse, 12–30 mm long, 4–13 mm wide, auriculate at the apex, 1–2 mm long, rarely acute, (5–)10–12-nerved, 5–7 nerves more salient, alternate with the other 5–7 and 2 lateral thinner nerves that do not reach the apex and are sometimes absent; in both bracts and stipules the nerves joining at different levels, only a few reaching the apex or running into the petiole, all having rigid rusty hairs 5–6 mm long inside and long cilia at the margins. *Leaves* with 4 leaflets, exceptionally in young plants 3, subequal, obovate or subtriangular, rarely suborbicular or with divergent lobules, 20–70 mm long, 25–75 mm wide, truncate, roundish, incised $^1/_{10}$ of its length, the midrib sometimes lengthened with a short mucro, discolorous, with a transverse fringe, purplish to blackish in the middle, the hairs simple or rarely short pluri-cellular, reddish on the nerves below, rarely above and on the margin, generally with small unequal translucid or dark oxalate spots located near the incision on the margin or scattered on the upper part of the blade; petioles 5–30 cm, glabrous or sparsely hairy. *Inflorescences* of bifid cymes, umbelliform 3–2-flowered, peduncles as tall as the foliage or much taller, to 50 cm, similar to the petioles; bracts 2–4 mm long, 2–2.5 mm wide, and bracteoles smaller, hyaline, ovate to rhombic, generally keeled, the midrib lengthened in a mucro, sometimes covered with oxalate calli, irregularly long ciliate; pedicels to 17 mm articulate at the base. *Flowers* with the sepals green, oblong to elliptic, 4–7.5 mm long, 1–2 mm wide, the margin hyaline, obtuse, truncate to subacute, glabrous or with a few hairs and glandular hairs, the apex ciliate with 2–4 unequal, linear, apically parallel calli, obtuse, truncate or subacute; petals pink to violet, the lower part greenish-white, 2–5 times the length of the calyx, seldom with glandular and short hairs outside; stamens longer, 2.5–4 mm long, with short hirsute, uneven hairs and glandular hairs above, the ligule large, linear, obtuse, near the middle the shorter stamens 1.5–2.5 mm long, enlarged to the base, glabrous, connate to ¼–½; pistils mostly macrostylous, only 1 mesostylous and 1 microstylous, 5–7 mm long, the ovary glabrous or with hairs at the top of the carpel backs, the styles pilose with curved hairs and a few glandular hairs, the stigma bifid, papillose, the carpels 3–6-ovuled. *Capsule* cylindric, acute, 13 mm long, glabrous, the calyx up to ¼ of its length, the styles ca. 1.5 mm long, the carpels 4–5-seeded, the interior pilose; seeds tawny, ovoid, flattened, apiculate, 1.25 mm long, 9–14-ribbed in zig-zag, the 12–16 transversal striae prominent.

This species seems to originate from Mexico. It has been introduced to all the continents, often cultivated as a good luck token. Difficult to eradicate, it does not seem, however, to be weedy.

CHIRIQUÍ: Finca Lérida, S slope of the Quebrada Velo, 5000 ft, *Allen 4733* (G, MO, NY). Boquete near Finca Collins, *Blum & Dwyer 2556* (MO). Above Boquete, 4500 ft, *D'Arcy 5447* (MO, P). 1.5 mi from Boquete, *Dwyer & Hayden 7636* (GH, MO). Boquete near Finca Collins, *Ebinger 727* (F, MO, US). 3 mi N of Boquete, 3200–4200 ft, *Lewis et al. 428* (GH, MO). Bajo Mona and Quebrada Chiquero, 1500 m, *Woodson & Schery 568* (MO).

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FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR., AND ROBERT W. SCHERY
AND COLLABORATORS

Part VI

FAMILY 93. MALPIGHIACEAE

JOSÉ CUATRECASAS[2] AND THOMAS B. CROAT[3]

Trees, shrubs, or scandent *lianas,* seldom subshrubs. *Leaves* simple, opposite or subopposite; petiole often glandular; blades entire, rarely lobate or irregularly toothed when juvenile, often with abaxial or marginal glands; venation pinnate; stipules present; T-shaped trichomes frequently present. *Flowers* bisexual, actinomorphic or usually obliquously zygomorphic principally by modification of 1 petal, and diversification of stamens and styles; in many-flowered, axillary panicles, pseudo-racemes, or umbels; pedicels sessile or articulate to bibracteolate peduncles whcch are borne in the axils of bracts; bracts and bracteoles conspicuous or small, sometimes glandular; calyx of 5 sepals, more or less united at the base, the lobes quincuncial, rarely valvate in bud; often with a pair of conspicuous glands; petals 5, showy, free, often yellow, but also white, pink, red and violet, clawed, fringed or toothed, alternate to the sepals; the interior petal often reduced and of another color, sometimes all equal, the claw articulated with the limb; stamens (8–)10, equal or unequal, sometimes with the 5 epipetalous stamens reduced, sometimes with 4 stamens opposite the 4 glandular sepals reduced to staminodes, sometimes with the 3 stamens opposite the 3 carpels much enlarged (*Stigmaphyllon, Banisteriopsis* spp.), the filaments more or less connate at the base, rarely free, usually glabrous, the anthers 2-celled, basifixed or dorsifixed, introrse, dehiscing longitudinally, often with a thickened connective, sometimes glandular, sometimes appendaged; ovary superior, mostly 3-locular, (2–)3(–4)-carpellate; placentation axile, the ovules solitary in each locule, pendulous, semi-anatropous; style (2–)3 free, rarely connate, distally terete, triangularly dilated, spatulate or sometimes appendages forming a hood over the stamens, rarely with only 1 style developed, the stigmatic tissue uniform at the tip of the styles or on their adaxial angle. *Fruit* usually a schizocarp of 3 samaras, sometimes a drupe with 1–3 pyrenes (*Bunchosia, Byrsonima, Malpighia*), a 2- or 3-locular dehiscent capsule (*Galphimia*) or separable indehiscent cocci (*Pterandra*); seeds ovoid, endosperm lacking, cotyledons flat, slightly curved, folded, uncinate or spirally rolled (*Byrsonima, Pterandra*).

The pubescence of Malpighiaceae, though rarely stellate, generally consists

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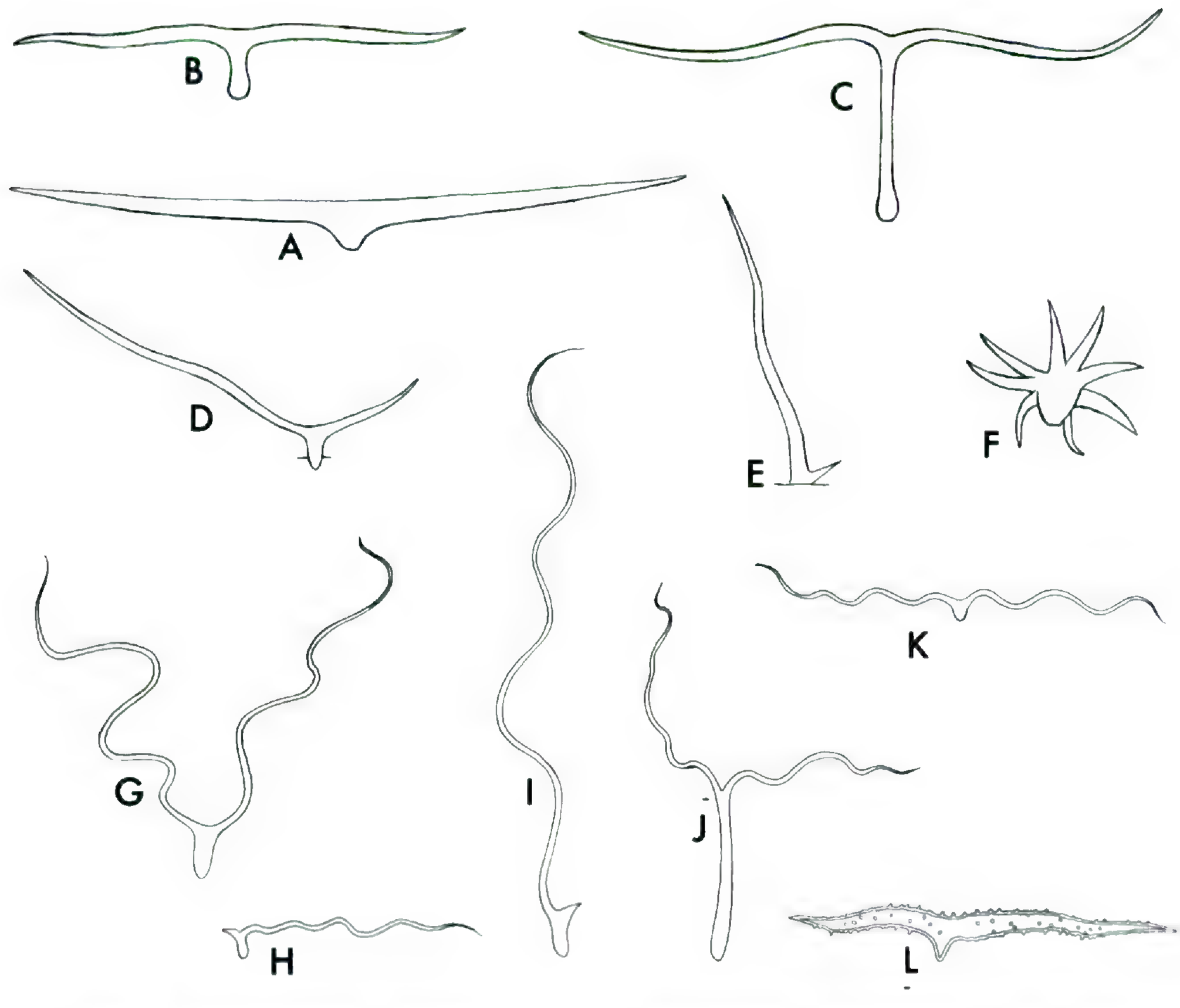

FIGURE 1. Malpighiaceous trichomes.—A.–K. Trichome types found generally in the family.—L. Unusual warty type found in *Banisteriopsis caapi* (Spruce) Morton. See Text for explanation.

of unicellular bifurcate, generally T-shaped trichomes. Types A, B, C, G, J and K (Fig. 1) have arms of equal length. Types A and K are sessile, whereas B, C, G and J are variously stipitated. Types D, E, H, and I have unequal arms; in E and J the longest arm is erect, looking superficially like a simple unbranched hair, whereas in type D the arms are less unequal and divergent laterally. Types A, B, C, D, E, have thicker cell membranes and are firm and straight, whereas types G, H, I, J and K, have thinner cell membranes and are flexuous; these types, especially G, I and J, make a lanate indument. Type L is a sessile medifixed trichome with minute warts as in *Banisteriopsis caapi* (Spruce) Morton.

Niedenzu (1928) in the last major revision of the family divided the Malpighiaceae in two subfamilies and seven tribes. The subfamily *Hiraeoideae* (*Pyramidotorae*) includes the tribes: 1. *Hiraeeae*, 2. *Banisterieae* and 3. *Triccomarieae* the many genera of which consist mostly of woody lianas, many with winged fruits; of these, 14 genera are exclusive of the Old World, all other genera are restricted to the New World, with the exception of a single African species of the large neotropical genus *Heteropteris*. The second Niedenzu subfamily *Malpighioideae* (*Planitoreae*), includes the Niedenzu tribes 4. *Galphimieae* and 5.

Malpighieae, and consists mostly of trees, erect shrubs and subshrubs, exclusively American.

The family consists of about 60 genera with 850 species, mostly in the American tropics. Members range from Texas and the Bahamas to northern Argentina and occur in habitats ranging from wet rain forests to arid areas.

Some malpighiaceous trees produce fine-grain wood which is used locally for making furniture and in construction. The bark and wood of some species are rich in tannins and are used in small factories as dyeing or tanning material. Many species produce drupaceous fleshy fruits or acidulous juicy berries which are directly eaten or prepared into jellies or preserves. The juice of *Malpighia emarginata* Sesse & Moc. is rich is ascorbic acid (vitamin C). Some species of *Banisteriopsis* contain alkaloids, like harmaline (=yageine, banisterine, telepathine) with dramatic hallucinogenic effects. "Ayahuasca," "caapi," "yagé," and "natem" are the most general common names for *B. caapi* (Spruce) Morton in Brazil, Colombia, Ecuador, Peru, etc. where the natives have been using it for centuries in ceremonial celebration. Other species of *Banisteriopsis* and other genera (e.g. *Tetrapteris*) also have harmaline and several other chemical derivatives with a diversified spectrum of narcotic effects, according to the recent progress of research in this field (e.g. Schultes & Hofmann, 1973).

The generally zygomorphic flowers of the Malpighiaceae are probably bee pollinated (Croat, 1978) and the fruits are mostly wind-dispersed. A few species, such as species of *Spachea*, *Bunchosia* and *Malpighia* are endozoochorous perhaps at least in part by bats (Croat, 1978).

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KEY TO THE GENERA

a. Fruit a schizocarp splitting into 3 samaras; receptacle pyramidal; usually lianas or climbing shrubs.
  b. Dorsal wing of the samaras well developed, large, conspicuous; lateral wings short or absent.
    c. Stamens 10, subequal, fertile; style tips blunt, stigma apical, subapical or at the adaxial angle of the styles, or hooked; samara wing thickened on upper or lower margin.
      d. Samara wing thick on the upper margin, thin along the lower margin; styles subulate, the stigma capitulate, apical or subapical ---------- 1. *Banisteriopsis*
      dd. Samara wing thin at the upper margin, thickened at the lower margin; styles usually thicker and unequal, dilated, spathulate-truncate or hooked at apex, the stigma at its adaxial angle ---------- 5. *Heteropteris*
    cc. Stamens 10, unequal, only 4–6 fertile with thicker anthers; styles unequal, the apex enlarged, triangular-truncate, hooked or with foliaceous appendices, the stigma at the inner angle; samara wing thickened on upper margin, thin on lower margin ---------- ---------- ---------- 13. *Stigmaphyllon*
  bb. Dorsal wing of the samara obsolete or much reduced; lateral wing or wings well developed and larger than the dorsal wing.
    e. Flower bud covered until anthesis by 2 large, cochleariform, opposite, embracing bracteoles. Sepals oblong or spathulate, densely pubescent abaxially, soon reflexed ---------- 10. *Mezia*
    ee. Flower bud not covered by 2 large bracteoles before anthesis; sepals linear, oblong, ovate or oblong-ovate.
      f. Sepals linear or oblong with subvalvate estivation, pubescent on both sides, soon reflexed; 4 sepals with one large subbasal gland; bracteoles linear or oblong; samara body with 3 cavities, the median monospermous, 2 lateral empty; the dorsal wing developed ---------- 7. *Jubelina*
      ff. Sepals ovate or oblong-ovate with quincuncial estivation, usually glabrous within, usually erect, each with 2 dorsal glands or eglandular; samara body unilocular with no lateral empty cavities, the dorsal wing shortly carinate, crested or not developed.
        g. Lateral samara wing parted into 4 narrower wings disposed like an X, all equal or with the abaxial pair shorter than the upper pair or obsolete ---------- 14. *Tetrapteris*
        gg. Lateral samara wing continued into a disc encircling the body, parted (open) at the adaxial line, or parted both at the adaxial and abaxial points, thus separating a wing to each side.
          h. Pedicels pedunculate (articulate), the pair of bracteoles at the apex of the floral peduncle. Stipules inserted on the stem close to the base of the petiole ---------- 9. *Mascagnia*
          hh. Pedicels sessile, the bracteoles at the base. Stipules inserted on the petiole ---------- 6. *Hiraea*
aa. Fruit drupaceous, a loculicidal capsule or a smooth 3-coccoid schizocarp; receptacle flat; usually trees or erect shrubs.
  i. Fruit schizocarp splitting into 3–2 indehiscent, smooth, glabrous or pilose cocci.
    j. Styles short, obtuse at apex. Inflorescences long, pseudo-racemiform, terminal; flowers usually 1–2 per branch; ovary glabrous, lacking a gynopodium; pedicels pedunculate; anthers not appendiculate ---------- 12. *Spachea*
    jj. Styles long, subulate. Inflorescences short, subumbellate or fasciculate, axillary or extraxillary; flowers 3 or more per branch; ovary pubescent, sitting on thick, broad gynopodium; pedicels sessile; anthers with dorsal narrow laminar appendix ---------- 11. *Pterandra*
  ii. Fruit drupaceous or capsular.

k. Fruit a 3–2-locular, loculicidal capsule ---------- 4. *Galphimia*
kk. Fruit a drupe or nut, with 3–1 pyrenes.
l. Styles subulate, acute; drupe monopyrenous, 3-locular, 3-seeded; cotyledons spirally involute; receptacle hirsute ---------- 3. *Byrsonima*
ll. Styles spathulate, obtuse or truncate at apex; drupes (di-)tripyrenous; cotyledons almost flat or shortly hooked at the end; receptacle glabrous.
m. Petals pink, red, lilac, or white; bracteoles without a dorsal gland; pyrenes rough, with 3–5 dorsal ribs or crests; cotyledons hooked at apex; styles free; flowers in small axillary corymbs or subumbellate ---------- 8. *Malpighia*
mm. Petals yellow; bracteoles with a dorsal gland; pyrenes without crests or ribs; cotyledons straight, plano-convex; styles more or less united or free; flowers in axillary or terminal racemiform inflorescences ---------- 2. *Bunchosia*

1. BANISTERIOPSIS

Banisteriopsis, C. B. Robinson in Small, N. Amer. Fl. 25: 131. 1910. TYPE: *B. cornifolia* (H.B.K.) C. B. Rob. (see Cuatrecasas, 1958, p. 487). *Banisteria* sensu auct. non L., H.B.K.

Lianas. Leaves opposite, (rarely ternate elsewhere), simple, entire, petiolate, coriaceous to membranaceous, commonly glandular along the margin or at the base; stipules interpetiolar, minute, caducous. *Inflorescences* of umbels, corymbs or rarely racemes arranged in bracteate or leafy, axillary or terminal panicles. *Flowers* pink, yellow or white; sepals 5, usually ovate, the petals 5, clawed, glabrous or sericeous outside, the limb orbicular or obovate, entire or fimbriate, frequently unequal, the anterior petal being more deeply fimbriate or of different size; stamens 10, frequently unequal, the 3 posterior stamens and the 2 epipetalous (lateral) stamens reduced in size, the anterior stamen sometimes much enlarged, the filaments frequently united at the base, the anthers glabrous or pilose (not Panama), the connective thick, glandular; styles generally equal, truncate or capitate, uniformly stigmatic, the ovary trilobate, gibbose, hirsute. *Fruit* a schizocarp of 3 samaras, these with a single dorsal wing, with a thickened ventral margin and a thin dorsal margin, lateral wings absent or poorly developed, the body smooth or with minute wings, tubercles or transverse ridges; embryo curved.

Banisteriopsis is a neotropical genus with about 90 species, mostly lianas, more or less frequent in rain forest, subandean forest and savannas, usually below 1,000 m elevation. Some species, e.g. *B. caapi* (Spruce) Morton, *B. rusbiana* Ndzu. are well known as popular among natives because of their strong hallucinogenous effects. *Banisteriopsis caapi* especially is cultivated to a limited extent by Indians in Brazil, Colombia, Ecuador and Peru and also by other people who occasionally have spread its cultivation outside of its original area. No specimens, spontaneous or planted of this species have been found in Panama.

Much confusion has surrounded the nomenclature of plants now called *Banisteriopsis*. Linnaeus, in describing *Banisteria* in the first edition of Species Plantarum (1753), included 7 species which are now in 3 genera. *Heteropteris* was segregated by Kunth in H.B.K. (1822), *Stigmaphyllon* by Jussieu in 1833, and *Banisteriopsis* was later applied to the remaining species in the North American Flora by Small (1910), who based part of his work on an unpublished manuscript

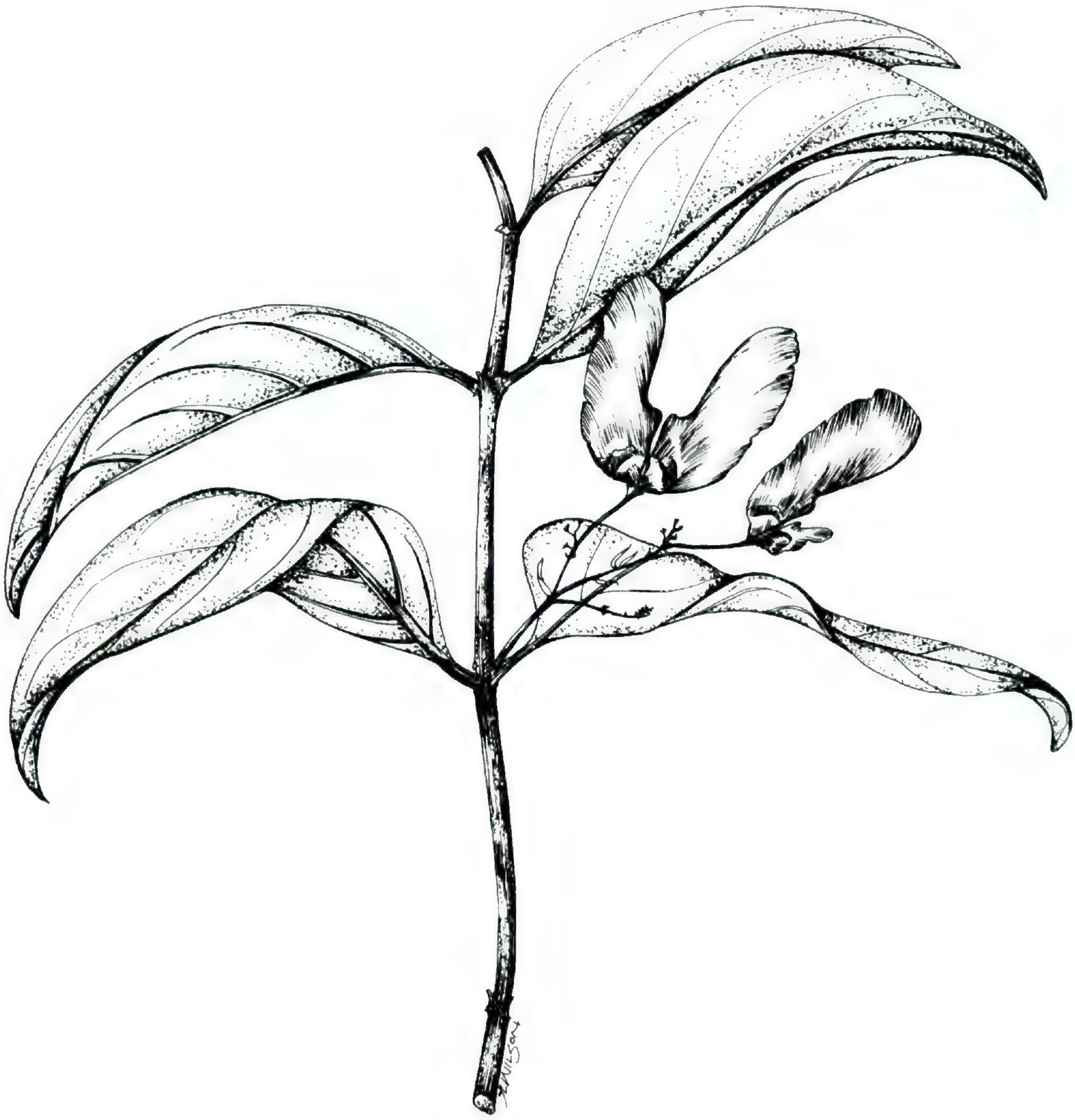

FIGURE 2. *Banisteriopsis cornifolia* (H.B.K.) C. B. Robinson ex Small. Fruiting branch (×3/5). [After *Tyson et al. 3090* (MO).]

by C. B Robinson. The latter name corresonds to the genus *Banisteria* in the sense of Jussieu, De Candolle, Grisebach, Hooker f., and the monographer Niedenzu who had used the name improperly. The conservation of *Heteropteris* against *Banisteria* eliminated this name from legal use and with it the existing confusion.

a. Leaves abaxially densely silvery sericeous with appressed or subappressed, straight, fine trichomes; petals pink ---------- 3. *B. muricata*
aa. Leaves glabrous or slightly pubescent; petals yellow.
  b. Pedicels and sepals glabrous, or exceptionally with few trichomes at the apex of pedicel and base of sepals ---------- 2. *B. martiniana*
  bb. Pedicels and sepals moderately to densely strigose.
    c. Samara body with a single short lateral wing on each side; petals glabrous; leaf blades sparsely appressed-pubescent throughout on lower surface at maturity ---------- 1. *B. cornifolia*

cc. Samara body with 5–8 conspicuous ridges or wings on each side; petals strigose on the outer surface; leaf blades essentially glabrous on lower surface at maturity ---------- 4. *B. panamensis*

1. **Banisteriopsis cornifolia** (H.B.K.) C. B. Robinson in Small, N. Amer. Fl. 25: 132. 1910.—FIG. 2.

Heteropteris cornifolia H.B.K., Nov. Gen. Sp. Pl. 5: 165. 1822. TYPE: Colombia, near Ibague, 700 m, *Humboldt & Bonpland* (P, not seen; F, photo FM 37487).
Banisteria cornifolia (H.B.K.) Spreng., Syst. Veg. 2: 388. 1825.
B. maracaibensis Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot., sér. 2. 13:) 285. 1840. TYPE: Venezuela, Maracaibo, *Pleé* (not seen).
B. guatemalensis Niedenzu, Gen. Banist. 6. 1900. TYPE: Guatemala, *Seler 2428* (B, not seen; F, photo FM 12811).

Liana; young stems, petioles and blades below densely to sparsely pubescent with appressed T-shaped trichomes (type A). *Leaves* opposite, subcoriaceous, mostly elliptic, sometimes ovate, gradually acuminate at the apex, the acumen often downturned, rounded at base, 9–16(–18) cm long, 4.5–7 cm wide, glabrous and somewhat shiny and rugulose above, the minute reticulum obvious, with the veinlets less than 1 mm apart, sparsely appressed-pubescent throughout beneath; petioles 5–10 mm long, with 1 or 2 sessile glands along each side near the apex. *Inflorescences* cymose-paniculate, many-flowered, much-branched, axillary or terminal, 4–15 cm long; flowers solitary or several per axil; peduncle, pedicels and sepals densely appressed-pubescent; peduncle to 3.5 cm long; pedicels sessile, to 5–10 mm long, to 1.5 cm long in fruit. *Flowers* yellow, sepals ovate, 2–3 mm long, the glands elliptical, to 1.5 mm long, more or less contiguous; petals clawed, 4–7 mm long, yellow, glabrous, early caducous, the anterior petal often slightly larger and with a more fimbriate margin than the remaining petals; stamens sometimes unequal, to 2.0 mm long, glabrous, free to base, the anthers oblong, glandular; styles 3, distinct, to 2.3 mm long, glabrous except near base. *Samaras* 1–3, each with a single dorsal wing which is thickened along the inner side; seminiferous area ca. 8 mm long, densely pubescent, raised, with a small wing or ridge on both sides; wing 2.5–3.5 cm long, ca. 1 cm wide, short appressed pubescent especially near the body and along the dorsal margin, with an obtuse lobe ca. 1 cm high on the inner margin close to the body.

In Panama, the species flowers from November to March with fruits maturing throughout the dry season.

This species ranges from southern Mexico to Peru. In Panama it occurs in undisturbed sites mostly in tropical moist forest, though one collection by Allen (*2091*) might have been made in premontane wet forest.

CANAL ZONE: Gamboa Navy Pipeline, *Correa et al. 485, 526* (DUKE, MO, PMA). Pipeline Road, 2–4 mi N of Gamboa, *Gentry 6530* (DAV, DUKE, MO, PMA); *Gentry & Dwyer 3348* (MO). Without other locality, *Gentry & Dwyer 3356* (NY). Corozal, *Sharp s.n.* (SCZ). Without other locality, *Steyermark & Allen 16776* (MO). BARRO COLORADO ISLAND: *Foster 1478* (MO); *Shattuck 635, 645* (both MO); *Wetmore & Abbe 63* (A, MO). COLÓN: Near Salamanca, 8 mi E of Transisthmian Highway, 100 m, *Gentry 6703* (MO). LOS SANTOS: 16 m S of Macaracas at Quebrado Bejuco, *Tyson et al. 3090* (MO). PANAMÁ: Without other locality, *Allen 1129* (GH, NY, MO, US). Cerro Campana, *Allen 2091* (F, GH, MO). Isla del Rey, *Duke 9531* (MO). Río Grande Station, Panama Railroad, *Hayes 770* (NY). VERAGUAS: Cañasas, *Tyson 3619* (MO).

2. **Banisteriopsis martiniana** (Juss.) Cuatr., Webbia 8: 498. 1958.

Banisteria martiniana Juss., Monogr. Malpigh. 159. 1843. TYPE: French Guiana, *Martin* (not seen).
Banisteriopsis martiniana (Juss.) Cuatr. var. *elegans* (Tr. & Pl.) Cuatr., Webbia 8: 501. 1958.
Banisteria elegans Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 322. 1862. TYPE: Colombia: Prov. Buenaventura, cordilla occ., 1000 m, *Triana & Planchon* (not seen).
B. elegans subsp. *ovata* Niedenzu, Malpigh. (Pflanzenr. 141(93):) 413. 1928. TYPE: Colombia, Buenaventura, *Triana* (not seen; F, photo FM 24250).
Banisteriopsis scalariformis Schery, Ann. Missouri Bot. Gard. 30: 93. 1943. TYPE: Panama, *Wedel 2776* (MO, holotype).

Liana; stems shiny, moderately appressed-pubescent, glabrescent. *Leaves* opposite, coriaceous, mostly elliptic-ovate, sometimes oblong-elliptic, mostly abruptly acuminate at the apex, obtuse to rounded or subcordate at the base, 4.5–13 cm long, 2.5–6.5 cm wide, often with a pair of large round or ellipsoid glands at the base, glabrous to sparsely pubescent with fine, flexuose trichomes on both the surfaces, entire or occasionally with minute glandular teeth, midrib prominently sunken, primary lateral veins arcuate-ascending, prominulous, secondary lateral veins prominulous, with the reticulum on the upper surface obscure, areoles usually more than 1 mm across, petioles canaliculate, sparsely appressed-pubescent, 4–12 mm long. *Inflorescences* cymose-paniculate, axillary and terminal, many-flowered, the branches sparsely appressed-pubescent; bracteoles leaf-like but narrower, with glandular teeth; terminal peduncles short, 4–6-flowered, appressed-pubescent; pedicels slender, glabrous, 4–12 mm long. *Flowers* yellow; petals and sepals glabrous; sepals membranaceous, suborbicular, ca. 2 mm long, their basal glands oblong, thick, ca. 2 mm long at anthesis; petals clawed, suborbicular, shortly fimbriate with glandular teeth, to 1 cm long including claw, to 8.5 cm wide; stamens with filaments glabrous, connate basally, ca. 3 mm long, the anthers orbicular to ellipsoid, ca. 0.8 mm long, the connective thick, glandular; ovary villose, the styles 3, ca. 3.2 mm long, equal, truncate at apex. *Samaras* 2.5–2.8 cm long, becoming reddish, sparsely stramineous-strigose, rounded at the apex, the ventral margin thickened, curved outward, lateral wings lacking, the seminiferous area smooth.

The pubescence consists of T-shaped trichomes of type A.

In Panama flowering occurs principally in the dry season (collections seen February to May) but also in the late wet season (September).

The species extends from Guatemala to the Guianas and Peru. Material from Panama and Colombia could possibly be distinguished from the typical variety as var. *elegans* (Tr. & Pl.) Cuatr. The leaves have more prominent reticulate venation and the margins are smooth, eglandular and eciliate. It occurs at undisturbed sites in areas of premontane wet forests and tropical wet forests as well as in wetter parts of tropical moist forest.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 2378* (US), *2776* (MO), *2791* (MO, US). CHIRIQUÍ: Cerro Colorado Copper Mine, 28 mi above San Félix, 9–10 mi above turnoff to Escopeta, 1200–1500 m, *Croat 33246* (MICH, MO). COCLÉ: La Mesa, *Dwyer 8322, 8322A* (both MO). Sawmill above El Copé, 1000 m, *Hammel 2620* (MO). Beyond La Pintada, 400–600 m, *Hunter & Allen 539* (MO). COLÓN: Río Guanche ca. 2.5 km upriver from bridge to Portobelo, *Crosby & Denslow 6474* (MO). DARIÉN: Cerro Tacarcuna west ridge, trail toward Río Pucuro just below summit camp, 1500–1600 m, *Gentry and Mori 14142* (MICH, MO, US). LOS SANTOS: Quebrada Bejuco, *Tyson et al. 3090* (MO, SCZ). PANAMÁ: 7 mi N of Cerro Azul, 2600 ft, *Blum et al. 1778* (MO, OS). El Llano-Cartí road 10 mi from Interamerican Highway near El Llano, 330 m, *Croat 33790* (MO). Cerro Jefe, *Duke 9412*

(MO, US); *Dwyer et al. 5040, 7300* (both MO). El Llano-Cartí Road, 17.5 km from Interamerican Highway, *Mori et al. 4599* (MICH, MO, PMA, US). Cerro Jefe, *Mori & Kallunki 711* (MO), *3604* (MICH, MO, PMA). 15.4 km N of Cerro Azul, *Mori & Kallunki 4940* (MICH, MO, PMA). El Llano-Cartí road, 10.5 km from Panamerican Highway, *Nee 10517* (MICH, MO, PMA, US, VEN). Cerro Campana, *Porter et al. 4318* (MO). Cerro Jefe, *Tyson 3435* (MO, SCZ); *Tyson et al. 3188A* (MO, SCZ, US), *4356* (PMA); *Wilbur 13615* (MO).

3. **Banisteriopsis muricata** (Cav.) Cuatr., Webbia 8: 503. 1958.

Banisteria muricata Cav., Diss. 9: 423., Pl. 246. 1790. TYPE: Peru, *Jussieu* (P, not seen; F, photo FM 37469).
Heteropteris argentea H.B.K. Nov. Gen. Sp. Pl. 5: 164. 1822. TYPE: Colombia, *Humbolt & Bonpland* (P; F, photo FM 37488).
Banisteria argentea (H.B.K.) Spreng., Syst. Veg. 2: 388. 1825.
B. schomburgkiana Benth., London J. Bot. 7: 129. 1848. TYPE: Brazil. Río Branco, *Schomburgk 844* (K, not seen).
B. schlimii Turcz., Bull. Soc. Nat. Mosc. 36: 584. 1863. TYPE: Colombia, Ocana, 3900 ft, *Schlim 108* (not seen).
Banisteriopsis schomburgkiana (Benth.) C. B. Robinson, N. Amer. Fl. 25: 133. 1910.
B. argentea (H.B.K.) C. B. Robinson, N. Amer. Fl. 25: 138. 1910.
Banisteria argentea var. *obtusiuscula* fo. *glandulifera* Niedenzu, Malpigh. (Pflanzenr. 141(93):) 436. 1928. SYNTYPE: Panama: *Killip 3203* (GH, US).
Banisteria argentea var. *acuminata*, fo. *eglandulosa* Niedenzu. Malpigh. (Pflanzenr. 141(93):) 436. 1928. TYPE: Peru, *Jussieu* (P, not seen).

Liana; stems densely cinereous appressed-pubescent when young, glabrate in age. *Leaves* opposite, thin, ovate to ovate-elliptic, acute to acuminate at the apex, apiculate, obtuse to rounded at base, 3–10 cm long, 1.3–6 cm wide, moderately appressed-pubescent above, silvery-sericeous beneath, entire; petioles slender, narrowly canaliculate, densely appressed-pubescent, 5–13 mm long. *Inflorescences* cymose-paniculate, axillary and terminal, many-flowered; branches, pedicels and calyces sericeous; pedicels slender, 3–10 mm long. *Flowers* pink or white; sepals narrowly ovate, to 2 mm long, glands oblong-linear, ca. 1 mm long; petals ca. 6 mm long, with a broad, usually white claw bearing thick glands at the apex, the blade suborbicular, ca. 3 mm wide, finely lacerate, usually pink; stamens with filaments glabrous, ca. 2.2 mm long, free to the thickened base, the anthers ellipsoid, ca. 9 mm long; ovary villose, the styles slender, equal, glabrous, to 2.5 mm long, the stigma truncate. *Samaras* 2.5–3.5 cm long, oblong to obovate-lunate, subsericeous, becoming reddish, the ventral margin thick, sigmoid, the dorsal margin nearly straight to broadly rounded, the seminiferous area sericeous, tuberculate-muricate, the projections to 3 mm long.

The species is recognized by its silvery-sericeous lower blade surfaces and pink flowers as well as by its samaroid fruits with numerous small hornlike projections.

In Panama, flowering occurs from October to December with fruits maturing from November to January.

The species ranges from Mexico to Bolivia. It is ecologically variable, often preferring disturbed sites usually in drier parts of tropical moist forest, premontane moist forest, and tropical dry forest, but it has also been collected in premontane wet forest.

CANAL ZONE: Ft. Kobbe, *Allen 2018* (F, GH, MO, US). Near Summit Naval Radio Station, *Croat 12536* (DUKE, F, MO, PMA, SCZ). Panamerican Highway near La Chorrera, *D'Arcy 9451* (K, MO). Road C-21, N of Corozal, *Dressler 3145* (DUKE, MO, PMA, SCZ). Ancón Hill, *Duke 4596*

(GH, MO, US). Road C-21, *Duke 5781* (GH, MO). Cerro Galera, 350–400 m, *Gentry 6607* (CAS, COL, DUKE, GH, MISSA, MO, RSA, US). Farfan Beach, *Gentry & Dwyer 3544* (MO). C2, E of Ft. Clayton, *Harvey 5118* (F). Curundu, *Harvey 5189* (F). Without other locality, *Higgins 213* (US). Summit Garden, *Lindsay* (US). Gaillard Highway, 1 km NW of Summit Gardens, *Mori & Kallunki 2933* (DUKE, MO, PMA). Madden Dam Road, 1–2 km N of junction with Gaillard Highway, *Nee 7612* (CAS, COL, F, GH, MISSA, MO, PMA, TEX). Cerro Pelado, 1 km N of Gamboa, 200–220 m, *Nee 7425* (MO, PMA, TENN). ½ km W of Summit Garden, 70 m, *Nee 7536* (C, CAS, COL, DUKE, F, GA, K, L, M, MER, MICH, MO, NY, P, PMA, RSA, S, TEX, U, US, VEN), *9488* (AAU, KRA, MIN, MO, PMA, SD). Top of Semaphore Hill at Radar Station, 1½ km N of Summit Gardens, 200–240 m, *Nee 9513* (BAA, BANU, BR, CBG, COL, DAV, F, GH, MO, NY, PMA, VDB). Summit Hills Golf Club, *Sharp* 11/27/1962 (SCZ). Road K-9, *Smith & Smith 3257* (F, MO, PMA). Summit, *Standley 30103* (US). CHIRIQUÍ: 1 mi W of airport at Puerto Armuelles, *Croat 21890* (MO). COCLÉ: El Valle de Antón, 600 m, *Allen 2776* (A, MO, US). Road to El Copé, *Correa 404* (DUKE, MO). La Pintada, *Leon 38* (PMA). Aguadulce in savannas, near sea level, *Pittier 4949* (F, US). Potrero de Penonomé, *Puga 22* (PMA). HERRERA: Pesé, ca. 200 ft, *Burch et al. 1300* (GH, K, NY, UC, US). 3 km from the district of Los Posos on the road to Pesé, *Carrasquilla 266* (DUKE, F, MO, PMA). LOS SANTOS: Las Trancas-Guarare, *Velasquez 33* (MO, PMA). PANAMÁ: Bejuco, *Allen 972* (GH, MO, US). Pacora, 35 m, *Allen 1116* (GH, MO, US). Taboga Island, *Celestino 50* (US). Cerro Campana, *D'Arcy 9588* (MO). Weedy area S of Tocumen Airport, *D'Arcy 9644* (MO, TEX). Hill above Chepo de las Minas, 700 m, *Folsom et al. 6985* (MO). 7.6 mi from Tocumen Circle, *Gentry 2159* (MO). Río Pasiga, *Gentry 2385* (MO). Cerro Jefe, ca. 1000 m, *Gentry 6159* (DUKE, MICH, MO, NY, PMA, RSA, US). Savannas, *Heriberto 182* (GH, US). Cerro Azul, *Jaén 42* (DUKE, MO). Chilibre, *Jaén 49* (DUKE, MO). Taboga, *Killip 3203* (GH, US). 5 km SW of Arraijan on road to Bique, 20–40 m, *Nee 7696* (AAU, L, MO, PMA). T.V. tower on ridge 3 km S of Alcade Díaz, 410–440 m, *Nee 8568* (GH, MO, PMA, TEX). Sabanas NE of Panama City, *Paul 189* (US). Camino del Boticario near Chepo, 30–50 m, *Pittier 4699* (US). Bella Vista, *Standley 25377* (F, US). Near Punta Paitilla, *Standley 26230* (US). Corozal Road, *Standley 26876* (US). Río Tocumen, *Standley 29438* (US). Juan Díaz, *Standley 30568* (US). Between Mathías Hernández and Juan Díaz, *Standley 32027* (US). 1 mi E of El Llano, *Tyson 6894* (MO, PMA). SAN BLAS: Lower Río Ailigandí, *Duke 9328* (MO, OS). VERAGUAS: Hills W of Soná, 500 m, *Allen 1030* (GH, MO, US). 25.3 mi from Aguadulce, *Gentry 2923* (MO, PMA). 4.5 mi S of Santa Fé, ca. 300 m, *Gentry 2938* (MO). Just S of Santa Fé, 450 m, *Nee 8019* (BRY, ENCB, M, MO, PMA, WIS). Above Río Santa María along road to Santiago, 5 km S of Santa Fé, 250–300 m, *Nee 8144* (F, K, MO, PMA, RSA, U). 2 km NW of Atalaya, 100 m, *Nee 8220* (IJ, MO, MPU, PMA).

4. **Banisteriopsis panamensis** Cuatr. & Croat.[4] TYPE: Panama, *D'Arcy & D'Arcy 6260* (MO-2164097, holotype).

Slender *liana*; young stems sparsely appressed pubescent with T-shaped trichomes, these sessile or weakly stalked with branches short and stiff or moderately thin, somewhat flexuous, older stems glabrous, smooth to finely lenticellulate. *Leaves* opposite, ovate-elliptic to narrowly elliptic, acuminate at the apex, acute to obtuse at the base, 4–9.5 cm long, 1.7–4.5 cm wide, usually drying dark brown, sometimes drying green at least when in flower, glabrous to sparsely strigose on both sides near the midrib, becoming glabrous, moderately stiff, the major lateral veins 5–7, arcuate-ascending and weakly loop-connected; petioles canaliculate, 5–9 mm long, strigose becoming glabrous. *Inflorescences* terminal or in upper axils, corymbose, the peduncles, pedicels and calyces moderately to densely strigose, the trichomes, appressed, short, brown, T-shaped; peduncles

[4] *Banisteriopsis panamensis* Cuatr. & Croat, spec. nov. Samara nux 10–12 mm diametro, utroque latere 5–8 costis inaequalibus transverse obliquis, prominentibus, angulatis, saepe 2 vel 3 plus minusve alatis, omnibus radiale usque ad basim argute instructis; areola ventrali elliptica 3–4 mm longa. Ala dorsalis 34–44 mm longa, chartacea, margine superiori robusta laevi, inferiori tenui breviter crenulata, elliptica sursum saepe asymmetrice ampliata, 14–20 mm lata, ad basim angustior 10–12 mm lata, margine inferiori juxta nucem haud constricta, margine superiori appendice basali semiovata 3–7 mm alta 6–10 mm longa instructa.

1–13 mm long; pedicels 10–18 mm long (to 25 mm in fruit). *Flowers* yellow; calyx lobes biglandular, 3.3–4.0 mm long, acute to rounded at the apex, the margin sometimes glabrous, glands oblong, 2.5–3.5 mm long; petals 7–10 mm long, clawed, the blade elliptical to rounded, fimbriate marginally, the inner surface glabrous, the outer surface and claw strigose, glabrous near the margins; stamens 4–5 mm long, the filaments glabrous, the anthers ca. 1.3 mm long; style glabrous, slightly exceeding the stamens, the ovary densely reddish-brown pubescent. *Samaras* red, 4.0–5.5 cm long, sparsely strigose, the wing 3.4–4.4 cm long, chartaceous, the dorsal margin with a thin semiovate basal appendage 3–7 mm high, 6–10 mm long, becoming thickened toward the apex, moderately straight then becoming convexly curved, narrowed at the base, the broadest part 1.4–2.0 cm wide, 1.0–1.2 cm wide near the base, the seminiferous area 10–12 mm long with 5–8 conspicuous unequal transverse oblique ribs, 2 or 3 of these winglike, to ca. 5 mm long.

Banisteriopsis panamensis differs from all other *Banisteriopsis* in Panama in having strigose petals. It is closely related to *B. platyptera* (Griseb.) Cuatr. (Type: *Karsten (4) N 55,* NY). In that species, as well as in *B. pubipetala* Juss., the samara body has 2 secondary wings which are transversal, perpendicular to the main, dorsal, large wing; the surface of the body below the lower wing is obconical and smooth; the dorsal wing is constricted at the base, especially the lower margin.

The Dressler collection (*4331*) differs from all the others in drying green, in having slightly smaller petals and in having denser, more flexuous trichomes on the younger parts, but it is doubtful that it is specifically distinct.

Banisteriopsis panamensis is known from tropical wet forest and premontane rain forest in central and eastern Panama. Flowering collections have been made in January, April and in August. Fruiting collections were made in September and October.

COLÓN: Santa Rita Ridge, 2–3 mi from highway, *Gentry 1868* (MO, SCZ). DARIÉN: W ridge of Cerro Mali ca. ½ hour W of helipad on trail toward Río Pucro Valley, 1400 m, *Gentry & Mori 13826* (MICH, MO, PMA, RSA, US, VEN). PANAMÁ: Cerro Jefe, *D'Arcy & D'Arcy 6260* (MO); *Gentry 2114, 6159* (both MO); *Gentry & Dwyer 5543* (CR, F, MICH, MO, NY, RSA). El Llano-Cartí road, 9.6 km from Panamerican Highway, *Mori 7732* (MO); *Mori & Kallunki 1836* (MICH, MO, PMA, US).

2. BUNCHOSIA

Bunchosia Richard ex H.B.K., Nov. Gen. Sp. Pl. 5: 153. 1822. TYPE: *Malpighia odorata* Jacq.

Trees or *shrubs*. *Leaves* opposite, coriaceous, chartaceous or membranaceous; stipules small, interpetiolar, linear-lanceolate, close to the base of the petiole. *Inflorescences* of pseudoracemes, axillary or terminal; peduncles bibracteolate; 1 of the bracteoles generally glandular. *Flowers* pedicellate; sepals 5, ovate or elliptic, obtuse with 10 glands or apparently fewer because of fusion; petals yellow, glabrous, clawed, with the limb generally orbicular and dentate, glandular or eglandular; stamens 10, almost equal; filaments glabrous, united into a tube at the base; anthers ellipsoid or somewhat oblong, connective globose,

ovate or semiglobose; ovary 2- or 3-carpellate, 2- or 3-locular, villose or glabrous, the styles 2 or 3, free or united, receptacle flat, glabrous. *Drupe* with 2 or 3 cartilaginous, smooth or somewhat rugose pyrenes; embryo straight; cotyledons thick.

Bunchosia is a neotropical genus of about 50 species ranging from Mexico to Paraguay and Bolivia, but especially in Mexico, Central America, the West Indies and northern South America.

The drupaceous fruits of some species are edible and palatable, as those of *B. armeniaca* (Cav.) DC. and *B. cornifolia*. These are red or orange red, the size of a large cherry; they are often cultivated by people who call them "cereza" or "cereza de monte" in Panama according to Standley (1928).

a. Inflorescences terminal, of short bifoliate branchlets ..... 3. *B. diphylla* ssp. *brevisurcularis*
aa. Inflorescences axillary.
  b. Inflorescences divided from near the base into 3 subequal racemiform branches ..... 7. *B. ternata*
  bb. Inflorescences racemiform, the axis simple.
    c. Leaf blades glabrous or subglabrous.
      d. Leaf blades coriaceous, rigid, narrowly elliptic-lanceolate, gradually acuminate at apex, attenuate at base, rather small, 6–10 × 2–3 cm; fruit 3-locular ..... 8. *B. tutensis*
      dd. Leaf blades subcoriaceous, more flexible, elliptic to elliptic-oblong, usually abruptly long acuminate at apex, 9–17 × 3.5–6.5 cm; axes of inflorescences and peduncles with appressed or subappressed trichomes; ovary 3- or 2-carpellate ..... 5. *B. lindeniana*
    cc. Leaf blades conspicuously appressed pubescent, pilose or tomentose.
      e. Leaf blades densely or sparsely appressed or subappressed pilose, trichomes sessile or with very short pedicel.
        f. Blades with thin, sessile, mostly very appressed trichomes.
          g. Blades with small, very fine trichomes, thin and straight, all sessile, more or less completely appressed, only occasionally in contact, ca. 0.5 mm long; ovary 2-carpellate ..... 1. *B. cornifolia*
          gg. Blades with larger, very fine, thin and more or less flexuose, sessile appressed or short-stalked trichomes, usually very crowded and contiguous with one another, to ca. 1 mm long; ovary 3-carpellate ..... 4. *B. lanieri*
        ff. Leaf blades with subappressed, thicker trichomes, the stalk short or inconspicuous, the arms straight, acute, subappressed parallel to the surface ..... 2. *B. dwyeri*
      ee. Leaf blades densely or sparsely patulous pilose, the trichomes very fine with long pedicel and long spreading or patulous arms, entangled into an abundant tomentum ..... 6. *B. odorata*
        h. Leaf blades membranaceous or thin papyraceous, usually densely pubescent, of medium size; gynoecium usually 2-parted ..... *B. odorata* fo. *odorata*
        hh. Leaf blades chartaceous or subcoriaceous, strongly nerved beneath, usually larger in size; gynoecium usually 3-parted ..... *B. odorata* fo. *macrophylla*

1. **Bunchosia cornifolia** H.B.K., Nov. Gen. Sp. Pl. 5: 154. 1822. TYPE: Colombia, between Turbaco and Cartagena, *Humboldt & Bonpland* (P, not seen; F, photo FM 37491).

B. glauca H.B.K., Nov. Gen. Sp. Pl. 5: 155. 1822. TYPE: Colombia, circa Honda, *Humboldt & Bonpland* (P, not seen; F, photo FM 12841).

Shrub or *tree*, to 6 m tall; pubescent throughout with appressed T-shaped

trichomes, especially on the younger and lower parts and on the leaf blade below; stems becoming glabrous, with lenticels and a very thin grayish periderm which may be easily scraped off. *Leaves* opposite, membranaceous, elliptic to oblong-elliptic, acuminate at the apex, obtuse to acute at the base and decurrent-revolute onto petiole, 6–15(–35) cm long, 3–6(–8) cm wide, the upper surface soon glabrous, the lower surface persistently pubescent and also glaucous with scattered glands especially near the base, the margin often somewhat undulate; petioles 4–10 mm long, puberulent or glabrous; dried leaves make a characteristic oily deposit on drying papers. *Inflorescences* axillary pseudoracemes, 5–8 cm long, mostly 8–16-flowered; bracts ovate-lanceolate, 1.5–3.0 mm long; peduncles puberulent, 2–4 mm long; bracts ovate, acute, weakly puberulent, ciliate, 1 mm long, one glandulate stipules minute, triangular. *Flowers* 1.0–1.5 cm broad, 5-parted; sepals oblong-elliptic, rounded at the apex, each lobe inflexed, usually bearing 2 conspicuous obovate-oblong glands; petals yellow, clawed, rounded to oblong, spreading, the margin irregular, one or more petals prominently concave, interior petal somewhat erect, its margin entire; stamens 8, subequal, in a staggered whorl, 5 held in close proximity to style, the longest ca. 2.7 mm long; filaments thickened at the base, weakly fused; anthers dehiscing inward, the connective somewhat thickened apically; styles 3, to 1.5 mm long; stigmas short, fleshy, held just above the anthers; ovary weakly pubescent. *Drupe* ovoid, orange turning red at maturity, 1.5–2.5 cm long, with the style bases persistent; exocarp thin; mesocarp pasty, eventually sweet and tasty, 2–3 mm thick; pyrenes usually 2, ovoid-hemispheroid, to 17 mm long, with a thin reticulate covering.

Flowering occurs from December to July, principally April to July, but rarely as late as September. Fruits mature chiefly from July to January, rarely as late as March.

Bunchosia cornifolia ranges from Mexico to Colombia. It is ecologically variable. Though most common in tropical moist forest, it occurs also in tropical wet forest, and less frequently in tropical dry forest and lower montane rain forest.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 2667* (MO, US). CANAL ZONE: Victoria Fill near Miraflores Locks, *Allen 1745* (MO, US). Ft. Kobbe Road, *Allen 1891* (MO, US). Near crossing of Cruces Trail and Madden Dam Road, *Bartlett & Lasser 16443* (MO). Near Summit Hills Golf Course, *Croat 10950* (MO, NY), *12266* (MO, NY, SCZ). Road C2, vicinity of Police Lodge, *Croat 12988* (MO, NY, SCZ). Gaillard Highway between Paraiso and Continental Divide, *Croat 14832* (MO). Road to Gamboa, *Croat 15013* (MO). Near beach at Fort Kobbe, *Duke 4238* (MO). Farfan Beach, *Dwyer et al. 544* (MO, NY). Below Miraflores Locks, *Gentry 749* (MO). Chiva Chiva Trail, *Gentry 6332* (MO, PMA). Boy Scout Camp near Madden Dam, *Kirkbride 43* (MO, NY). Just below Madden Dam, *Kirkbride 49* (MO, NY). Río Chagres, *Lasseigne 4267* (MO). 2 mi N of Paraiso on Balboa Highway, *Lazor & Blum 5316* (MO). Ft. Kobbe Military Reservation, *Luteyn 1085* (MO, NY). Chiva Chiva Trail, *Maxon 6598* (US). Howard Air Force Base SE of Kobbe Beach, *Oliver & MacBride 1873* (US). Gamboa, *Pittier 3700, 3765* (both US). Curundu, *Spellman et al. 552* (MO). Miraflores Locks Corosion Laboratory, *Stern et al. 57* (GH, MO, US). Farfan Beach, *Sullivan 574* (MICH, MO, US). Curundu near Survival School, *Tyson 1041, 1058* (both MO, PMA, SCZ, US), *4462* (DUKE, MO, SCZ, US). Miraflores Locks area, *Tyson & Blum 2002* (MO, SCZ). Fort Sherman, *Tyson & Blum 3795* (MO). Fort Clayton near old hospital building, *Tyson & Blum 3925* (MO, SCZ). Old town site of Red Tank, *Tyson & Blum 4013* (MO, SCZ). Miraflores, *White 142* (MO). Fort Kobbe Road, *Woodson et al. 1418* (MO). Salamanca Hydrographic Station, Río Pequení, ca. 80 m, *Woodson et al. 1615* (MO). Mt. Obscuro, *Zetek 3512, 3685* (MO). BARRO COLORADO ISLAND: *Croat 4972, 5201, 5923* (all MO, SCZ), *8182* (G, MO, NY), *11107* (MO); *Foster 976, 1029* (PMA). CHIRIQUÍ: Trail from Paso Ancho to Monte Lirio, *Allen 1469* (MO, US). Valley of Río Chiriquí, *Duke 9027* (MO, OS). COLÓN: Coastline between Garotte and La Guaira, *D'Arcy 9352* (MO). Río Guanche, 2–4 mi upriver, *Dressler*

et al. 2331 (GH). Río Fató, *Pittier 3840* (US). DARIÉN: Río Chico, *Allen 4601* (MO). Santa Fé, *Duke & Bristan 308* (MO, OS). Río Charco-Espiritu on Tocumen Highway, *Duke 5704* (MO). Pinas, *Duke 10583, 10585* (both MO, OS, US). Patino, southern Darién, *Pittier 6982* (US). 3 mi E of Santa Fé, *Tyson et al. 4667* (MO, SCZ). LOS SANTOS: Las Tables, *Dwyer 1144, 2428* (both MO). Ridge W of Río Pedregal, *Holdridge 6240* (MO, OS, PMA, SCZ). Río Tonosí vicinity of Tonosí, *Lewis et al. 1537* (COL, DUKE, F, MO, NY, UC, US). PANAMÁ: Without other locality, *Anderson* (US); *Buitrago 27* (MO); *Diaz 47* (MO, PMA). Carretera hacia Pacora a 1 km despues del autodromo, *Carrasquilla 189* (MO, PMA). Isla del Rey, *Correa 105* (MO). 1 mi E of El Llano, *Croat 14483* (MO, SCZ). Río Maje, *Croat 34690* (MO). Isla del Rey, *Duke 9551* (MO). San José Island, *Duke 12535* (MO, US). Chame, *Duran 43* (PMA). Tocumen, *Dwyer 5027* (MO, US). Chepo, sea level, *Maurice 758* (MO, US). Near Tapia River, *Maxon & Harvey 6617* (US). Trapiche Island, Pearl Islands, *Miller 1878* (US). Trail from Boticario near Chepo, *Pittier 4690* (US). Sabanas, *Riley 109* (MO, US); *Standley 25872* (US). Juan Díaz, *Standley 30555* (US). Without other locality, *Wagner 19413* (US, photo). VERAGUAS: Isla de Coiba, *Dwyer 2396* (MO). WITHOUT LOCALITY: *Duchassaing* (P).

2. **Bunchosia dwyeri** Cuatr. & Croat.[5] TYPE: Panama, *Dwyer et al. 8230* (MO-2164635, holotype; PMA, isotype).

Shrub or small *tree*, 1.5–15.0 m tall; trunks 8–20 cm d.b.h; stems sparsely to densely pubescent with sessile or short stalked, T-shaped, whitish trichomes, soon glabrous or nearly so. *Leaves* opposite, broadly ellipsoid to obovate, moderately thick, acuminate to short acuminate at the apex, obtuse to rounded or subcordate at the base, 7–32 cm long, 3.5–19.0 cm wide, glabrous or sparsely pubescent above, sometimes only on the major veins, the trichomes almost sessile, sparsely to moderately pubescent beneath, beneath with a pair of platter-shaped glands along the midrib near the base, sparsely pubescent, the trichomes 1.5 mm long, straight, subappressed, usually with a very short stalk; primary lateral veins 6–11 on each side, secondary veins moderately prominent; petioles 2–15 mm long, coarsely appressed-pubescent; stipules thickened, deltoid, to 5 mm long, pubescent. *Inflorescences* axillary pseudoracemes, 5–15-flowered, 4–11 cm long; rachis appressed to somewhat patulous pubescent; bracts narrowly deltoid, 2.0–2.5 mm long, villous outside, glabrous within; bracteoles similar, slightly smaller, one of them with a depressed globose gland ca. 1 mm in diameter at the base; peduncles 1.5–2.4 mm long; pedicels 4–8 mm long. *Flowers* 14–18 mm wide; calyx glands 8, 2.5–3.5 mm long, oblong; sepals rounded at the apex, sparsely appressed-pubescent on the outer surface, conspicuously ciliate, 2–4 mm long; petals yellow, clawed, the limb subrounded, ca. 8 mm in diameter, the margins erose, interior petal somewhat smaller, the margin both erose and glandular; stamens ca. 4 mm long, somewhat unequal, the filaments glabrous, flattened, united in at least the basal ¼, the anthers ca. 1 mm long, cordate to sagittate at the base, the connective thickened, more or less hemispherical; style about as long as the longer stamens, villous, much thickened at the apex. *Fruits* subglobose to ovoid, 1.5–2.0 cm long, red-orange to orange or red.

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[5] *Bunchosia dwyeri* Cuatr. & Croat, spec. nov. Rami sparse vel dense pubescentes deinde glabrati, pilis malpighiaceis sessilibus vel brevipediculatis. Lamina foliorum crassiuscula late elliptica vel obovata plus minusve acuminata, basi rotundata vel subcordata, 7–32 × 3.5–19 cm, supra glabra vel parce pubescens, subtus sparse vel copiose subadpresse pilosa pilis rectis acutis brevipediculatis, costa circa basim biglandulata. Pseudoracemi axillares, rachi adpresse vel semipatente pilosa; pedicelli 4–8 mm longi; sepala apice obtusa, extus sparse strigosa, margine ciliata; petala lutea, limbo 8 mm diam., margine erosa; filamenta complanata glabra basi coalita; antherae 1 mm longae; drupae subglobosae vel ovoideae 1.5–2 cm longae, aurantiaco-rubrae.

The species is recognized by its moderately sparsely subappressed-pubescent leaf blades. It is most easily confused with *B. cornifolia* and *B. lanieri* which are distinguished by having thinner, appressed trichomes.

The flowering pattern is uncertain. The species has been collected in flower throughout much of the year and individual plants appear to flower more than once per year.

This species is widespread in Panama and is to be expected in Costa Rica in Limon Province and in the Department of Chocó in Colombia. In Panama it is ecologically variable occurring in premontane moist forest, tropical moist forest, tropical wet forest, and premontane rain forest from near sea level to at least 1,400 meters.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 137, 138* (both US). Almirante, *Cooper 556* (US). Between Quebrada Higueron and Quebrada Gutierrez, *Kirkbride & Duke 756* (MO). Edge of Garey Creek, *McDaniel 5151* (MO). Chiriquí Lagoon, *Seibert 1552* (MO, US); *Wedel 1301, 2021, 2406, 2426, 2620* (all MO, US). Old Bank Island, *Wedel 2133* (MO, US). CANAL ZONE: Causeway and islands on Fort Amador, *Tyson 2022* (MO, SCZ, US). CHIRIQUÍ: Palo Santo, *Croat 13583* (CAS, DUKE, F, MICH, MO, RSA, US). Fortuna dam site, *Folsom et al. 5507* (MO). DARIÉN: Cabecera del Río Pirre, *Bristan 1312* (MO, OS, US). Río Balsa between Quebrada Chusomocatre and Río Aretí, *Duke 8708* (MO, US). PANAMÁ: Perlas Islands, Trapiche, *Allen 2628* (MO). NW of Punta Cruz in East Harbor, San Jose Island, *Correa 91, 92* (A, SCZ). Isla Pedro Gonzales, *Dwyer 1701, 1754* (CAS, MO). Between Cerro Jefe and Eneida, *Dwyer et al. 8230* (MO, PMA). San Jose Island, *Erlanson 102, 395* (US); *Harlow 24* (US); *Johnston 256* (MO, US); *Stimson 5334* (SCZ). Perlas Islands, Pacheca, *Tyson 5610* (MO). VERAGUAS: 5 mi N of Santiago near Santa María River, *Blum & Tyson 615* (MO, SCZ). Isla de Coiba, *Dwyer 562, 1608* (both CAS, MO), *2396* (MO, US).

3. **Bunchosia diphylla** (Jacq.) Cuatr. & Croat, comb. nov.

Malpighia dipylla Jacq., Enum. Syst. Pl. 21. 1760. TYPE: not seen.
Byrsonima diphylla (Jacq.) DC., Prodr. 1: 581. 1824.
Bunchosia columbica Niedenzu, Repert. Spec. Nov. Regni Veg. 26: 346. 1929. TYPE: not seen.

3a. **Bunchosia diphylla** ssp. **brevisurcularis** (Dobson) Cuatr. & Croat, stat. nov.

B. brevisurcularis Dobson, Brittonia 29: 184. *fig. 1.* 1977. TYPE: Panama, *Stern et al. 428* (MO, holotype; US, isotype).

Shrub or *tree* 3–8 m tall; stems weakly and sparsely appressed-pubescent when young, soon glabrous. *Leaves* opposite, elliptic to obovate-elliptic, bluntly acuminate to rarely acute or rounded at the apex, broadly acute to attenuate at the base, 5.5–15.0 cm long, 2.8–8.0 cm wide, lustrous and glabrous above, sparsely and inconspicuously pubescent beneath, the pubescence denser on the veins and near the margin, usually with 1 or more pairs of conspicuous plate-shaped, somewhat sunken glands near the base along the midrib; primary lateral veins 6–8 pairs, the secondary veins moderately obscure; petioles 4–8 mm long, glabrous to sparsely appressed-pubescent; stipules minute, sparsely pubescent, adhering to the petioles. *Pseudoracemes* 10–24-flowered, terminal, on short bifoliate branches, 4–8 cm long, usually shorter than the subtending leaves, the rachises densely appressed-pubescent; bracts narrowly triangular, pubescent, 1.5–2.0 mm long; bracteoles ovate–triangular, 1 of them with a large gland. *Flowers* yellow, 14–16 mm in diam.; petals glabrous, orbicular, subcordate, the margin denticulate and glandular, 5–7 mm in diam., the claw thick, 2 mm long; stamens glabrous, mostly united at the base, the anthers oblong, with the connective reddish, thick-

ened, subglobose; ovary trilocular, glabrous, the styles 3, thick, free, the apex truncate and dilated, subdiscoid; fruiting calyces 3.5–5.0 mm long, obtuse to rounded at the apex, glabrous, ciliate, thin along the margin, the glands 8, irregularly oblong, 2 of them formed by the fusion of 2 glands, often somewhat beaked and turned outward. *Fruits* 2- or 3-locular, ellipsoid to obovoid, 1.1–2.3 cm long, glabrous, red.

Bunchosia diphylla can be distinguished by its terminal inflorescence on bifoliate branchlets. Subspecies *brevisurcularis* differs from the typical variety in having broader, often obovate leaves and fewer-flowered inflorescences. Subspecies *brevisurcularis* probably flowers in March and April, with fruits maturing from April to July.

This species is known only from Panama in tropical moist forest and tropical wet forest life zones. The typical subspecies occurs in the North Atlantic coastal region of Colombia in the Departments of Bolivar, Atlantico, and Magdalena and eastward to the base of the Sierra de Perija and border zone of Zulia State in Venezuela.

Jacquin's diagnosis of *Malpighia diphylla*, although short, contains enough key characters to allow the identification of the species, thanks to the precise geographical location given: "Habitat carthagenae in sylvaticis maritimis." In the area of Cartagena, Bolivar, Colombia and in the whole region of the Atlantic coast up to Río Hacha and Guajira, only one species has been found with the terminal racemes on diphyllous branchlets and oval or ovate, glabrous leaves noted by Jacquin. This species is the one which has been known as *Bunchosia columbica* Niedenzu. Panamanian collections published as *B. brevisurcularis* are conspecific with Jacquin's species, the only difference being the firmer subcoriaceous, almost glabrous leaves. We maintain the Panamanian taxon as a subspecies of *B. diphylla* for the time being. The flowers of *brevisurcularis* are not yet known.

COLÓN: San Miguel de la Borda, *Croat 9891* (DUKE, F, MICH, MO, PMA, RSA, US). Fató, Nombre de Dios, *Pittier 3839* (US). DARIÉN: Between Quebrade Venado and Beja Swamp in headwaters of Río Tuquesa, *Bristan 1008* (MO, OS, US). Road from El Real to Pinogana, *Duke 4882* (GH, MO, PMA, UC, US). Río Pirre, *Duke 5088* (GH, MO). Without other locality, *Duke 8358* (MO, OS, US). 1–4 mi N of Pucro, *Duke 13048* (MO, OS, US). Quebrada Maskia off Río Pucro above Pucro, *Duke 13091* (OS, US). Puerto St. Dorothea beach, *Dwyer 2134* (MO). Paya, Río Paya trail between Paya and Payita, *Stern et al. 373* (CAS, DUKE, MICH, MO, US). Trail between Paya and Pucro, *Stern et al. 428* (DUKE, MICH, MO, PMA, US). Trail between Caná and Boca de Cupe, vicinity of El Real, *Stern et al. 606* (DUKE, F, MICH, MO, US).

4. **Bunchosia lanieri** Watson, Proc. Amer. Acad. Arts 21: 461. 1886. TYPE: Guatemala, on Camino Real near Izabal, *Watson 34* (not seen).

Shrub or small *tree* to 4 m tall. *Leaves* opposite, moderately thin, elliptic to ovate-elliptic or oblong-elliptic, apiculate or short-acuminate at the apex, obtuse to rounded at the base, 9.5–24.0 cm long, 3.6–11.0 cm wide, sparsely appressed-pubescent on the upper surface, densely mostly appressed-pubescent below, some of the trichomes weakly stalked and the arms at least weakly patulous; primary lateral veins 6–9 on each side, the secondary veins inconspicuous; petioles 7–10 mm long, appressed-pubescent; stipules paired, thick, narrowly tri-

angular, 4–5 mm long, appressed-pubescent. *Pseudoracemes* axillary, with up to 50 flowers, 4.5–19.5 cm long; bracts narrowly triangular, folded along the midrib, 3.5–5.0 mm long, densely villous outside, often with a buttonlike gland on 1 side at the base, especially near the base of inflorescence, glabrous inside; bracteoles much like bracts but smaller, the lowermost with a conspicuous gland at the base; rachis more or less villous, somewhat flattened toward the apex. *Flowers* ca. 16 mm in diam., yellow; sepal glands 8, ca. 2.5–3.0 mm long; sepals ovate-triangular, obtuse to narrowly rounded at the apex, sericeous outside, glabrous within; petals yellow, 7–8 mm long, clawed, glabrous, the limb rounded, the margin weakly erose, the interior petal smaller, the margin more entire but glandular; stamens somewhat unequal, exserted ca. 3 mm above the sepals, the filaments glabrous, flattened, united in the lower ⅓; ovary sericeous, the style held just above the cluster of stamens, truncate and 3-sided at the apex. *Fruits* 3-locular, depressed-globular and 3-lobed, orange-red, ca. 1.0 cm long and 1.5 cm wide.

Bunchosia lanieri is recognized by its conspicuously pubescent, often rather large leaves with the trichomes both sessile and shortly stalked. It is perhaps most easily confused with *B. cornifolia* which usually has smaller leaves with comparatively sparser, shorter, straighter trichomes on the lower blade surface.

Flowering collections were seen for August and December and mature fruits were seen in February.

This species ranges from Guatemala to western Panama. In Panama it occurs at elevations of less than 100 meters in tropical moist forest life zones.

CHIRIQUÍ: Monte Verde, *Busey 409* (DUKE, F, MICH, MO, NY, RSA, US, VEN). Río Dupi near sea level, *Pittier 5226* (US). Río San Cristobal, *Tyson 911* (MO).

5. **Bunchosia lindeniana** Juss., Monogr. Malpigh. 81. 1843. TYPE: Mexico, Veracruz, Mirador, *Linden 911* (not seen; F, photo FM 24223 of isotype at G).

B. lanceolata Turcz., Bull. Soc. Nat. Mosc. 36(1): 582. 1863. TYPE: Mexico, Veracruz, Orizaba, *Botteri* (not seen; but perhaps includes *Botteri 1093, 1109,* both US).

B. pringlei Watson, Proc. Amer. Acad. Arts 26: 133. 1891. TYPE: Mexico. San Luis Potosí; Tamasopo Cañon, *Pringle 3540* (not seen).

Shrub or small *tree* 2–8 m tall; stems sparsely appressed-pubescent with sessile T-shaped trichomes when young, glabrous in age. *Leaves* opposite, elliptic to oblong-elliptic, gradually to abruptly acuminate at the apex, rarely acute, acute to attenuate at the base, 5.5–20.5 cm long, 2–7 cm wide, subcoriaceous, glabrous or nearly so on both surfaces, usually with a pair of plate-shaped glands near the base, major lateral veins ca. 7 pairs, not prominent; petioles 4–8 mm long, sparsely appressed-pubescent to glabrous; stipules minute, appressed-pubescent. *Pseudoracemes* axillary, 5–10 cm long, the rachis sparsely appressed-pubescent, the trichomes more or less translucent, sessile or stalked; bracts narrowly triangular, 1.0–1.5 mm long, more or less glabrous to appressed-pubescent; bracteoles deltoid, to ca. 1 mm long, in part glandular. *Flowers* 10–15 mm in diam.; sepals rounded at the apex, glabrous, the margin ciliate, the glands 10; petals yellow, clawed, the limb ovate-cordate to spatulate, 2–5 mm long; stamens exserted to ca. 4 mm long, the filaments flattened and connate at the base, glabrous, the

anthers subrounded, ca. 7 mm long, the connective swollen; ovary 2- or 3-carpellate, globose, densely sericeous, the style ca. 2.5 mm long, pubescent. *Drupe* spheroid, 2- or 3-lobed, 10–12 mm long, glabrous, orange becoming red at maturity.

Flowering occurs mostly from April to August and fruiting occurs principally from December through February.

Bunchosia lindeniana ranges from Mexico (Veracruz) to western Panama, principally on the Atlantic slope. It is distinguished by its axillary inflorescence and glabrous usually acuminate leaf blades.

BOCAS DEL TORO: Trail to Río Abajo, 3 km SW of town of Almirante, 100–200 m, *Nee & Hansen 14112* (MO). COLÓN: Santa Rita lumber road 15 km E of Colon, *Dressler 3880* (PMA). SAN BLAS: Headwaters of Río Cuandí, Camp Diablo, Drill Site 22, *Duke 3620* (US).

6. **Bunchosia odorata** (Jacq.) H.B.K., Nov. Gen. Sp. Pl. 5: 153. 1822.

Malpighia odorata Jacq., Enum. Syst. Pl. 21. 1760; Select. Stirp. Amer. Hist. 136 and 137, *tab. 177, fig. 41.* 1763. TYPE: Colombia, Cartagena, *Jacquin* (not seen).

Bunchosia pilosa H.B.K., Nov. Gen. Sp. Pl. 5: 156. 1822. TYPE: Colombia, Turbaco, *Bonpland 1433* (P, isotype).

B. retusa Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 311. 1862. TYPE: Colombia, La Mesa, Junca, 1300 m, *Triana 3422* (P, lectotype).

B. costaricensis Rose in Pittier, Primit. Fl. Costaric. 2(1): 63. 1898. TYPE: Costa Rica, San José, Río Tiliri, 1130 m, *Pittier 4286* (US, syntype).

B. macrophylla Rose in Pittier, Primit. Fl. Costaric. 2(1): 64. 1898. TYPE: Costa Rica, between Sipurio and Tsuritkub (Talamanca), 100 m, *Pittier & Tonduz 8686* (US, lectotype).

Shrub or small tree 2–8(–12) m tall; trunks 8–12 cm d.b.h; stems densely pale brown, velutinous-tomentose, the trichomes stalked T-shaped, the branches variously divaricate. *Leaves* opposite, membranaceous, elliptic, ovate-elliptic, ovate or subrounded, abruptly acuminate to acute or rounded at the apex, obtuse to narrowly rounded at the base, 4–23 cm long, 1.8–12.0 cm wide, glabrous to sparsely pubescent on upper surface, especially along the midrib, sparsely to densely pubescent below, with 1 or 2 glands at the base on either side of the midrib, the trichomes long stalked, slender; primary lateral veins 5–7 pairs, the secondary veins conspicuous; petioles 2–10 cm long, densely velutinous-tomentose, to appressed-pubescent or glabrate; stipules minute, axillary, at times glandular at the base. *Pseudoracemes* axillary, 8–20-flowered, 2.5–11.0 cm long, the rachis velutinous-tomentose, flattened toward the apex; bracts ovate-lanceolate, 2–3 mm long; bracteoles ovate, acute, clasping, 1 mm long, 1 of them bearing a more or less plate-shaped sessile gland. *Flowers* 14–15 mm in diam.; calyx glands 10, oblong-obovate, glabrous, 2.0–3.5 mm long; sepals ovate, obtuse at the apex, villous, 2.0–2.5 mm long; petals suborbicular, ca. 6 mm in diam., glabrous, yellow, the margin denticulate, somewhat glandular at the base, the anterior petal with the margin glandular throughout; stamens glabrous, the connective ovoid; ovary glabrous or more frequently densely villous, bilocular; style ca. 3 mm long, sparsely villous, the apex dilated, 3-lobed–discoid. *Fruit* subglobose, red, glabrous or weakly puberulous, ca. 10 mm in diameter.

Bunchosia odorata can be recognized by its generally large, broad, softly pubescent leaves. Our material includes both the forma *odorata* and forma *macrophylla*. See the key for characters separating these 2 forms.

In Panama, flowering occurs to some extent throughout the year, but chiefly from April through October, especially in the late dry season and early rainy season in April and May. Plants often flower more than once per year. Fruits mature mostly from July to February, and mature fruits may be on the tree at the time of the second flowering period.

This species ranges from Panama to Colombia and Venezuela. In Panama, the species is highly variable ecologically, occurring in tropical dry, premontane moist, tropical moist, premontane wet, tropical wet, and lower montane rain forest life zones. Such a wide range of variation is unusual for a tropical shrub or tree.

BOCAS DEL TORO: Water Valley, *Wedel 866, 1520* (both MO, US). Chiriquí Lagoon, *Wedel 1808* (MO, US). Western River, *Wedel 2790* (MO, US). CANAL ZONE: Balboa at old Missouri Botanical Garden Tropical Station, *Croat 5366* (MO). Ancon Hill, *Croat 14667A* (MO). Coastal island beyond Fort Amador, *D'Arcy 9243* (MO). Fort Kobbe, Farfan area, *D'Arcy 9630* (MO). Near beach at Fort Kobbe, *Duke 4239* (US). Thatcher Ferry Road, *Duke 5761* (MO). Farfan Beach, *Dwyer et al. 545* (MO). Fort Sherman, U.S. Army TTC, *Dwyer 8591, 8591A* (MO). Near Beach at Fort Kobbe, *Gentry 6430* (MO, PMA). Ancón Hill, *Hladik 351* (MO); *Lewis et al. 5366* (MO). U.S.N. ammunition depot. *Luteyn & Foster 927* (MO). Chiva-Chiva Trail, *Maxon & Harvey 6595* (US). Between Corozal and Ancón, *Pittier 2179* (US). Albrook Research Forest Site, *Stimson 5148* (SCZ). Curundú, Survival School Area, *Tyson 1309, 4177* (both MO, SCZ). Causeway Island, Fort Amador, *Tyson 2013, 2030, 5406* (all MO, SCZ). CHIRIQUÍ: San Bartolo, *Busey 714* (MO). 8 mi W of Puerto Armuelles, vicinity of San Bartolo Límite, *Croat 22023* (CAS, DUKE, MICH, MO, PMA, US). Las Nubes, *Croat 22418a* (MO). E of Boquete, *Croat 26840* (MO). Slopes of Cerro Horqueta, *Croat 27019* (MO). COCLÉ: Rim of El Valle de Antón, *Allen 1811* (MO). S of El Valle de Antón, *Allen 2497* (MO, US). 3 mi NE of Antón, *Croat 9630* (MO, SCZ). El Valle, *Croat 25267* (DUKE, MICH, MO, RSA, US). 8 mi N of El Valle, *Luteyn & Kennedy 1697* (MO, NY, PMA). Outskirts of El Valle, *Mori 6635* (F, MICH, MO, US). Foot of Cerro Pilón, *Porter et al. 4588* (MO). Between Las Margaritas and El Valle, *Woodson et al. 1744* (MO). COLÓN: Río Guanche, *Foster et al. 2331* (G, MO, PMA). 10 mi SW of Portobelo, *Liesner 1064* (CAS, DUKE, F, K, MICH, MO, NY, P, PMA, S, U, US, VEN). DARIÉN: Without other locality, *Bristan 213* (MO). Patino, *Pittier 6984, 6987* (both US). HERRERA: Road between Ocú and Chitré, *D'Arcy & Croat 4142* (MO, PMA). LOS SANTOS: 1–2 mi W of Candellaria, *Duke 12441* (MO, US). Las Tablas, *Dwyer 141* (MO). PANAMÁ: La Jagua, *Bartlett & Laser 16373* (MO). Between Río Pacora and Chepo, *Croat 5162* (MO). Trail between Río Maje and Quebrada Brava, *Croat 34619* (MO, US). Slopes of Cerro Campana, *Croat 35967* (MO). Morro Island, off Taboga, *D'Arcy 6784* (MO). Grassland on Cerro Campana, *Duke 6019, 8685* (MO, OS, US). Savanna near Río Mar, *Duke 12406* (MO, US, WIS). La Jagua, *Duke 15034* (MO, OS). In forest along trail from 900 m to top of Cerro Campana, *Hammel 3796* (MO). Bella Vista, *Killip 12041* (US). Near Tapia River, Juan Diaz Region, *Maxon & Harvey 6732* (US). Bella Vista, suburb of Panama City, *Maxon & Valentine 6953* (US). Cerro Campana, *Mori & Kallunki 2489* (MICH, MO, US), *3557* (MICH, MO, PMA, US). Taboga Island, *Pittier 3537* (US). Sabana de Juan Corso near Chepo, *Pittier 4498* (MO, US). Between Río Pacora and Chepo, *Porter et al. 5162* (MO). Bella Vista, *Standley 25373, 25378* (US). Near swamp E of Río Tocumen, *Standley 26640* (US). Nuevo San Francisco, *Standley 30713* (US). Punta Paitilla, *Standley 30800, 30811* (US). Road to Cerro Campana, *Tyson 6431* (MO, PMA, SCZ). 5 mi W of Chepo, *Tyson 6707* (MO, PMA). Taboga Island, *Woodson et al. 1532* (MO, US). VERAGUAS: District Cañasas, road to Los Valles, *Croat 37036* (MO). N of Santa Fé on Escuela Agricola Alto de Piedra, *Mori & Kallunki 2506* (DUKE, MO, US). NW of Santa Fé, *Mori & Kallunki 2514* (MO, US), *4847* (MICH, MO, NY, US), *6199* (MO, US).

7. **Bunchosia ternata** Dobson, Brittonia 29: 184. 1977. TYPE: Panama, *Davidson 52* (GH, holotype; F, MO, US, isotypes).

Shrub or small *tree,* 2–7 m tall; stems with scattered T-shaped trichomes, glabrous in age. *Leaves* opposite, narrowly elliptic to oblong-elliptic or narrowly ovate, gradually to abruptly acuminate at the apex, rounded to attenuate at the base, (8–)10–22 cm long, (2.5–)5–12 cm wide, glabrous on the upper surface, sparsely and inconspicuously appressed-pubescent on the lower surface with one or more pairs of pale glands, at least the lowermost next to the midrib; primary

FIGURE 3. *Bunchosia tutensis* Dobson. Fruiting branch (×7/10). [After *Mori & Kallunki 5263*.]

lateral veins 5–7 on each side, prominently arcuate-ascending, the secondary veins moderately obscure; petioles 9–20 mm long, glabrous; stipules minute, glabrous. *Pseudoracemes* axillary, few-flowered, divided near the base into 3 subequal branches, the branches 6–12 cm long, sparsely pubescent to glabrous, the trichomes sessile or short-stalked, the arms much flattened; bracts narrowly triangular, to ca. 1.5 mm long, sparsely pubescent; bracteoles minute, ovate-triangular; pedicels 2–9 mm long, densely pubescent. *Flowers* yellow, 14–21 mm in diam., the sepals with the lobes oblong to ovate, 4–5 mm long, rounded at the apex, almost glabrous, weakly ciliate, with 8–9 glands ca. 2 mm long; petals clawed, the blade more or less rounded, erose along the margin, the outermost 4 petals 7.0–9.5 mm long, the innermost 8–9 mm long; stamens 4–5 mm long,

connate in basal ⅓–½, the anthers 1.2–1.4 mm long, the connective yellow; ovary 3-locular, 1.5–2.0 mm long, glabrous or crustose-puberulent, the styles ca. 4 mm long, connate, thickened at the apex. *Fruits* subglobose, glabrous, 11–12 mm long, 13–15 mm in diam., orange, turning red at maturity.

This species is recognized by its 3-branched axillary pseudoracemes and its sparsely pubescent leaf blades. Phenological behavior is uncertain. Flowering specimens were seen in January and August. Mature fruiting collections were seen in April and August.

Bunchosia ternata is endemic to Panama in lower montane wet and lower montane rain forest at elevations of 1,800–2,300 meters.

CHIRIQUÍ: Cerro Horqueta, *Blum & Dwyer 2629* (SCZ). Bajo Chorro, Boquete District, 6000 ft, *Davidson 52, 404* (both F, GH, MO, US). Cerro Horqueta, *Hagen 2036, 2171* (both MO, NY). Between Quebrada Honda and divide on Caldera-Chiriquicita Trail, *Kirkbride & Duke 949* (MO). Above Río Caldera, *Wilbur et al. 11065* (MO).

8. **Bunchosia tutensis** Dobson, Brittonia 29: 188. 1977. TYPE: Panama, *Mori & Kallunki 5263* (MO-2288039, holotype).—FIG. 3.

Shrub or small *tree*, 2–3 m tall, to 8 cm d.b.h; stems sparsely and inconspicuously appressed-pubescent, the trichomes very short, T-shaped. *Leaves* opposite, coriaceous, narrowly elliptic-lanceolate, acute to gradually acuminate at the apex, attenuate at the base, 4.0–9.5 cm long, 1.5–3.0 cm wide, both surfaces minutely and densely reddish-brown, glandular dotted upon magnification, the upper surface glabrous except sparsely appressed-pubescent along the midrib, the lower surface almost glabrous or sparsely appressed-pubescent with 1 or more pairs of sunken, plate-shaped glands near the base and with others scattered elsewhere on the blade, especially near the major veins, the margin revolute, the primary lateral veins 2–4 pairs, mostly arising in the lower ⅓ of the blade, then markedly ascending to near the apex; petioles almost glabrous or sparsely appressed-pubescent, 8–11 mm long. *Pseudoracemes* axillary, 6–7-flowered, 4–7 cm long, the axis inconspicuously and sparsely appressed-pubescent, the trichomes thick; bracts narrowly triangular, thick, sparsely pubescent, the bracteoles similar. *Flowers* not studied; fruiting calyx with 6–8 glands, several of them the result of fusion of 2 glands, the glands narrowly obovate, 3.5–4.5 mm long, the calyx obtuse at the apex, glabrous to sparsely and inconspicuously appressed-pubescent, ciliate. *Fruits* obovoid to ovoid, ca. 1 cm long, reddish-orange, glabrous.

Bunchosia tutensis is recognized by its small, nearly glabrous, narrowly elliptic-lanceolate, coriaceous leaves and 3-locular fruits.

This species has been collected in March and June in fruit.

Bunchosia tutensis is apparently endemic to Panama and has been collected only in lower montane rain forest at about 1,000 meters.

VERAGUAS: Cerro Tute, *Mori 6761* (MICH, MO, US). NW of Santa Fé, 2 km from Escuela Agrícola Alto de Piedra, *Mori & Kallunki 5263* (MO, US).

3. BYRSONIMA

Byrsonima L. C. Rich. ex Juss., Ann. Mus. Natl. Hist. Nat. 18: 481. 1811. TYPE: *Malpighia spicata* Cav.

Small to medium sized *trees*. *Leaves* opposite, simple, entire, petiolate; stipules intrapetiolar, each pair connated into an axillary ligule or both stipules free from one another at each side of the base of the petiole. *Pseudoracemes* terminal; pedicels short-pedunculate or subsessile, usually solitary or 2–3 per peduncle; bracts elliptic, lanceolate or subulate, small; bracteoles small. *Flowers* yellow, white, pink or reddish; sepals 5, ovate, usually pubescent, biglandular; petals 5, clawed, glabrous, the limb more or less concave, suborbicular; stamens 10, somewhat unequal, the filaments thick, flattened, often connate and adaxially hirsute at the base; anthers oblong, introrse, glabrous or more or less pilose; connective thickened, equaling the theca or surpassing it prominently, the thecae linear, obtuse or mucronate at apex; ovary pubescent or glabrous, ovoid, 3-carpellate, 3-locular; styles 3, distinct, subulate, acute, glabrous, often persistent; torus densely hirsute. *Drupes* suborbicular or ovoid, yellow or yellow-orange at maturity, the endocarp trilocular with 3–2(–1) seeds. Cotyledons coiled.

Byrsonima is a neotropical genus of about 120 species ranging from Mexico to Argentina. The genus inhabits regions ranging from moist forests to arid areas but most commonly the latter. See Jussieu (1843) and Niedenzu (1928: 679–762).

The bark of *Byrsonima* is rich in tannins and is used in tanning hides. The wood, being hard and resistant to decay, is used in construction. The more fleshy drupes of some species are edible.

Only three species of *Byrsonima* are known from Panama. Two of them belong to the subgenus *Brachyzeugma* Niedenzu, and they are spread more or less throughout the country. The other species, *B. nemoralis* belongs to subgenus *Macrozeugma* Niedenzu. All three species have axillary, triangular, single (connate) stipules at each leaf.

a. Apex of connective obtuse, equaling or little surpassing the anther sacs; leaf blades lanuginose to somewhat sericeous; petals yellow.
   b. Leaf blades coriaceous, broadly elliptic, obovate, ovate-lanceolate or broadly ovate-lanceolate; the blade surfaces as well as the branchlets more or less densely lanate, tomentose or lanuginose, the trichomes flexuose or curled and patulous 1. *B. crassifolia*
   bb. Leaf blades chartaceous, narrow-elliptic or elliptic-lanceolate; the blade surfaces as well as the branchlets, moderately or sparsley sericeous, the trichomes straight and appressed 3. *B. spicata*

aa. Apex of connective thickened, club shaped, appendaged, surpassing the anther sacs by 1 mm; leaf blades glabrous; petals from white to roseate 2. *B. nemoralis* ssp. *dressleri*

1. **Byrsonima crassfolia** (L.) H.B.K.,[6] Nov. Gen. Sp. Pl. 5: 149. 1822.

Malpighia crassifolia L., Sp. Pl. 426. 1753. TYPE: herb. Linnaeus "in America calidiore" (LINN 588-8, not seen; microfiche).

Byrsonima pulchra Sesse & Mocino ex DC., Prodr. 1: 1824. TYPE: Mexico, Sesse & Mocino (not seen; F, photo, FM 30545).

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[6] Other synonyms are listed in Cuatrecasas (1958). Only these names relate directly to Panamanian plants are listed here.

B. cumingana Juss., Malpigh. Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 332. 1840. TYPE: Western Colombia, *Cuming 1207* (BM, not seen).
B. fendleri Turcz., Bull. Soc. Nat. Mosc. 582. 1863. TYPE: Panama, *Fendler 24* (US, isotype).
B. panamensis Beurl., Svensk. Vet. Handl. 1854: 117. 1854. TYPE: Panama, Colon Province near Portobelo, *Billberg* (probably NY).
Malpighia pulchra Sesse & Mocino, Fl. Mexicana Ic. 115. 1894. TYPE: Mexico (S, not seen).

Tree, 4–13(–15) m tall, 15–30 cm d.b.h.; bark fissured and lenticellate; wood dull reddish-brown, hard, heavy; younger parts densely downy-tomentose, sparsely tomentose on upper leaf surface and becoming glabrate; stems with prominent leaf scars. *Leaves* opposite, obovate to elliptic or ovate, short-acuminate, acute to obtuse at base, 4–15 cm long, 2–9 cm wide, densely pubescent below with stalked trichomes, glabrescent except the midrib; midrib arched; petioles 0.5–1.5 cm long, stout. *Pseudoracemes* terminal, usually solitary, usually unbranched, sometimes with few short branches near the base, to 20 cm long; axes, branches, peduncles, bracts, and sepals densely pubescent when young, becoming glabrate; bracts ovate-lanceolate, 2–4 mm long, deciduous; bracteoles ovate, acute, 1.0–1.5 mm long; pedicels to 1.5 cm long; flowers many, yellow, becoming red-orange in age; sepals 5, 1.5–2.5 mm long, blunt, recurved, glabrous inside, each bearing 2, thick, oblong-ovoid glands; petals clawed, 10–13 mm long, glabrous, the blade suborbicular, concave, more or less equalling length of claw, the margin irregular, one petal often smaller and held somewhat erect, the others spreading to reflexed; stamens 10, 4–5 mm long, the filaments hispid at the base, the anthers introrse, 2.5–3.0 mm long, the thecae prominently raised shedding pollen in bud, the connective thickened; ovary usually pubescent, the styles 3, distinct, slender, slightly longer than or equaling the stamens, persisting on young fruits. *Drupe* ovate-globose, glabrous, 0.8–1.5 cm in diam., green turning yellow to reddish; pyrenes 1–3.

The species flowers from November to July, principally from March to June. Each tree flowers for about six weeks. The fruits mature principally in August and September.

Byrsonima crassifolia is a polymorphic species, varying greatly in leaf size and shape as well as in density of the indument. The ovary is usually glabrous, but some specimens are found with a more or less villous ovary. The lack of correlation in the variation of the mentioned characters prevent recognition of subspecific taxa.

In Central America this species is called Nance. In season, fruits are sold locally in various-sized bottles filled with water, and made into drinks and confections.

Byrsonima crassifolia ranges from Veracruz, Mexico, to Brazil and Paraguay and it occurs in the West Indies. In Panama, it is widespread and ecologically variable, known from tropical moist, tropical dry, premontane moist, premontane wet, and tropical wet forest.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 152* (F, NY, US). Near Río Caná mouth, *Gordon 10* (MO). Shores of Laguna de Chiriquí, 150 ft, *Stern & Chambers 106* (A, F, MO, NY, US). Without locality, *Wedel 342* (GH, MO). SW of Bocas at Macaw Hill, *Wedel 523, 535* (both GH, MO). Isla Colón, *Wedel 2468* (GH, MO, NY, US). CANAL ZONE: Along Chiva-Chiva Trail to searchlight station, 10–100 m, *Allen 949* (F, MO, US). Ancon Hill, *Bartlett & Lasser 16301* (MO). Isthmus of Panama, *Bigelow* (NY). Giral near Bat Cave, *Blum & Tyson 523* (MO). Without locality, *Christo-*

pherson 174 (NY, US). San José Island, *Correa 90* (A, DUKE, MO, PMA). Boyd Roosevelt Highway, 5 mi S of Santa Rita Road, *Croat 14534* (MO). Near Beach at Fort Kobbe, *Duke 4247* (MO). Curatella savanna W of Fort Kobbe, *Duke & Mussell 6579* (MO). Fort Sherman, *Dywer & Robyns 142* (MO). Coco Solo near Army Corps Engineers and ATTC, *Elias & Kirkbride 1602* (US). Fort Sherman, *Fairchild* (F). Chagres, *Fendler 24* (GH, MO, US). Near Madden Wye, *Gentry 5160* (F, MO, PMA). 3 mi NW of Gamboa on Pipeline Road, *B. Haines 465* (DUKE, F, MO). Chiva Chiva Road, *Harvey 5273* (F). Río Grande Station, Panama Railroad, *Hayes 928* (NY). Without locality, *Hayes 1028* (NY). Forest Preserve, *Hjerting & Rahn* (US). Ancon Hill, *Hladik 342* (MO). Albrook, *Holdridge 6419* (PMA). Without locality, *Johansen 10* (US). Miraflores, *Johansen 25* (MO). Pipeline Road, ca. 1 mi from gate, *Kennedy et al. 3068* (GH, MO, NY). 9 mi N of Gamboa on naval pipeline road, *Lazar 5284* (SCZ). Forest margin across from transmitter tower, *Lazar 5514* (SCZ). Obispo road, *Lindsay & Avila 319* (MO, SCZ). Ancon Hill, *Mori & Kallunki 2775* (MO, PMA). Chiva Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 2724, 5730* (both US). Road to San Lorenzo after Fort Sherman, *Quistgaard 10* (MO, PMA). Fort Sherman, U.S. Army Test Center Site, Skunk Hollow, *Robyns 142* (F). Corozal, *Sharp* (SCZ). Between France Field and Catival, *Standley 30168* (US). Cerro Luiza above Pedro Miguel Locks, *Stern & Chambers 6* (F, MO, NY, US). Farfan Beach, 10 m, *Sullivan 578* (MO, US). Miraflores Locks area, *Tyson 1128* (MO, PMA). BARRO COLORADO ISLAND: *Aviles 113* (MO); *Bailey & Bailey 89, 304* (F); *Bangham 459* (A, F); *Croat 3162, 4759* (DUKE, F, MO, NY, SCZ), *5268* (MO), *5446* (DUKE, F, MO, NY, SCZ), *6068, 6162* (both F, MO, NY, SCZ), *8702* (DUKE, F, MO, NY, SCZ), *11098* (MO); *Dwyer 1483* (MO); *Hayden 46* (GH, MO); *Hladik 364* (MO); *Killip 40008* (MO, US); *Salvoza 896* (A); *Shattuck 586* (F, MO), *974* (MO, US), *1034* (F, MO, US); *Starry 140* (F, MO); *Wetmore & Abbe 102* (F, GH); *White 88* (GH, MO); *Wilson 143* (F, MO). CHIRIQUÍ: Boquete, 900 m, *Allen 1019* (A, F, MO, NY, US). Trail from San Félix to Cerro Flor, 100–850 m, *Allen 1935* (MO). 5 mi S of Boquete, 3000 ft, *Allen 4693* (MO). Guanabano, 2–4 km S of Puerto Armuelles, *Busey 495* (MO). Burica Peninsula, Quebrada Manzillo, 6 km SSW of Puerto Armuelles, *Busey 734* (MO). Progreso, *Cooper & Slater 316* (F, US). Boquete, *Davidson 627* (A, F, MO, US). Boquete, Llanos Francia, 4 mi from Boquete toward Dolega, 4500 ft, *Dwyer & Hayden 7589* (US). Burica Peninsula, Quebrada Mellize, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 423* (MO). Alto Boquete savanna, 1125 m, *Partch, 69-53* (MO). Pastures around El Boquete, *Pittier* (US). El Boquete, 1000–1300 m, *Pittier 3008* (F, NY, US). Boquete, Llanos Francia, 3500 ft, *Stern et al. 1153, 1951* (MO). Río San Cristobal, 2 mi W of David, 150 m, *Tyson 921* (MO). Boquete, *Woodson & Schery 787* (GH, MO, US). COCLÉ: Hills S of El Valle, 700 m, *Allen 2520* (US). El Valle, 650 m, *Croat 25268* (MO). 1 mi E of Santa Clara Beach, *D'Arcy & D'Arcy 4088* (MO). Río Hondo between Antón and Penonomé, *Folsom 2913* (MO). Río Las Guias, *Folsom 3440* (MO). El Valle de Antón, *Gonzalez 14* (MO, PMA); *Harvey 5146* (F). Near Penonomé, *Harvey 5260* (F). Aguadulce, *Pittier 4882* (US). Llano Bonito N of Las Margaritas, 400–500 m, *Seibert 526* (A, MO, NY). 5 mi W of Penonomé along Panamerican Highway, *Tyson 7251* (PMA). 4 mi W of Antón on Río Chico, *Tyson & Blum 2591* (MO, SCZ). Penonomé, 50–1000 ft, *Williams 77, 213* (both NY). Between Las Margaritas and El Valle, *Woodson et al. 1277* (A, MO, NY, US). COLÓN: Punta Pedro, Icacal, between Salúd and Boca de Río Indio, *Howell 35* (MO). Nuevo Chagres, *Lewis et al. 1857* (US). 7 km NE of Puerto Pilón on road to Portobelo, *Nee 6681* (CAS, COL, MISSA, MO, PMA, US). Quebrada Santa Maria, 4½ km SW of Pina, 0–5 m, *Nee 11702* (MO, PMA, S, U). DARIÉN: Río Pirre, *Croat & Porter 15541* (MO). El Real, *Duke 5050* (MO). Río Tuira, 1–2 mi upstream from Boca del Cupe, *Duke 5383* (GH, MO). Río Pirre, *Duke 8263* (MO). Patino, *Duke 10521* (MO). Outskirts of La Palma, *Gentry 3918* (MO, PMA). HERRERA: Ocú, *Ebinger 1070* (MO, US). 12.5 mi S of Ocú, 1200 ft, *Lewis et al. 1642* (COL, DUKE, K, MO, UC, US). 1 mi N of Chupampa on road to Ocú, *Wilbur et al. 12101* (DUKE, F, GH, MO, NY, PMA, US). LOS SANTOS: 1 mi S of Pedasí, *Correa & Gallegos 72* (DUKE, F, GH, MO, NY, PMA, SCZ, US). 1–2 mi W of Candelaria, *Duke 12438, 12445* (both MO). PANAMÁ: Trapiche, Perlas Island, 0–15 m, *Allen 2612* (MO). National Airport, 50 ft, *Allen 4461* (MO). Chorrera, *Allen 4484* (MO). Without locality, *Andersson* (US); *Billberg* (NY). San Jose Island, *Campbell 2* (GH). Road to Ojos de Agua where it branches off Transisthmian Highway ca. 5 mi N of Panama City, *Correa et al. 5054* (F, GH, NY). Pedro Gonzalez Island, Perlas Islands, *Croat 9154* (D, MO, SCZ). Without locality, *Duchassaing* (NY). Cerro Campana, *Duke 6020* (GH, MO). Isla del Rey, *Duke 9528* (MO, OS, US). Cerro Azul, *Ebinger 423* (F, MO). San José Island, *Erlanson 25* (GH, US). Road to Cerro Jefe, 400 m, *Folsom et al. 1944* (MO). Las Cumbres, *Fuertes 19* (PMA). Taboga Island, *Gentry 5724* (MO). San José Island, *Harlow 68* (GH, US). Lidice, *Jaramillo 19* (MO, PMA). San José Island, *Johnston 20* (GH). Juan Díaz, *Killip* (US). 1 mi E of Chame on Panamerican Highway, *Lazor 2206* (MO). Altos de Río Pacora, 2500 ft, *Lewis et al. 2287* (MO, UC, US). Río Teta E of San Carlos, *Luteyn 1578* (D, MO). Near Tapia River, *Maxon & Harvey* (US). Near Fort Randolph, *Maxon & Harvey 6530* (US). Taboga Islnad, *Maxon 6924* (NY, US). Cerro Campana, 2600 ft, *McDaniel 6830* (DUKE, MO). Near Pacora River, *Miller* (US). Trapeche Island (Perlas Islands), *Miller* (US). Sajalesas River, *Miller 1804* (SU). Savannah 1.5 km from Panamerican Highway on Lago Mar Road, *Nee 10786* (MO). N side of Lago Cerro Azul, 650–700 m, *Nee 11547* (GH, MO,

PMA, RSA). Near Chame, *Ochoa 17* (PMA). Sabanas, *Paul 6* (US). Taboga Island, *Pittier 3570* (US). Sabana de Juan Corso near Chepo, *Pittier 4499, 4685, 6785* (NY, US). Between Río Pacora and Chepo, *Porter et al. 5153* (MO). Cerro Bandera, Las Cumbres, *Sandoval 50* (PMA). Perlas Islands, *Sanson 411* (GH). Arenoso, lower Río Trinidad, 26–50 m, *Seibert 629* (MO). Cerro Silvestre, *Reece 24* (PMA). Near Guayabito and road to Laguna, *Smith & Smith 3450, 3461* (both F, US). Near Punta Paitilla, *Standley 26278* (US). Near Big Swamp E of Río Tocumen, *Standley 26638* (US). Road to Ojas de Agua between Panama City and Colón, 5 mi N of Panama City, *Stimson et al. 5054* (DUKE, PMA, SCZ). Cerro Jefe, 800 m, *Sullivan 223* (D, F, MO, NY). Cerro Azul at 2000 m, *Tyson 2147* (MO). W slope of Cerro Campana, 2500 ft, *Tyson & Godfrey 2367* (US). Cermeño and Monte Oscuro, *Varela 8* (PMA). Isla Taboga, *Woodson et al. 1484* (A, MO, NY, US). VERAGUAS: Trail between Cañazas and foot of Cordillera Central, headwaters of Río Cañazas, 300–600 m, *Allen 168* (A, F, MO). Santiago, *Allen 4432* (MO). Santa Fé, 1000 ft, *Allen 4436* (MO). Ca. 5 mi NE of La Mesa, *Blum & Tyson 648* (MO, SCZ). Stream between Santa Fé and Escuela Agrícola Alto Piedra, 420 m, *Croat & Folsom 33976* (MO). Forest 12 km NW of Santa Fé, *D'Arcy 10348* (MO). Dry savanna 13 km W of Santiago, *D'Arcy 10643* (MO). 5 km S of Santa Fé below 500 m, *Folsom & Collins 1642* (MO). 4 mi E of Río San Pablo, Panamerican Highway, *Folsom et al.* (MO). Base of Cerro Tute between Santa Fé and agriculture school, *Folsom 3067* (MO). Just S of Santa Fé, 450 m, *Nee 8061* (L, MO, P, PMA, US). 2 km NW of Atalaya, 100 m, *Nee 8203* (MO, PMA, VEN, US). Panamerican Highway 13 km W of Santiago, *Skog et al. 4002* (MO). Cañazas, *Tyson 3634* (MO, SCZ). 8 mi S of Calobré, *Wilbur et al. 12150* (D, MO). WITHOUT LOCALITY: *Seemann 320* (NY).

2. **Byrsonima nemoralis** Cuatr., Webbia 13: 619. 1958. TYPE: Colombia: Valle; Costa del Pacifico, Río Cajambre, Barco selva en el Cerro El Sapote 60–150 m, *Cuatrecasas 17225* (US, holotype; F, VALLE, isotypes).

2a. **Byrsonima nemoralis** Cuatr. ssp. *dressleri* (Lewis) Cuatr. & Croat, stat. nov.

B. dressleri Lewis, Brittonia 25: 304. *fig. 1.* 1973. TYPE: Panama, *Lewis & Dressler 7547* (MO-2027043, holotype; BM, CAS, DUKE, F, GH, LE, MEXU, MO-2027044, NY, PH, PMA, PNU, SCZ, SMU, US, isotypes).

Tree, 6–20 m tall, 15–30 cm d.b.h. *Leaves* opposite, glabrous, clustered at ends of branchlets, obovate to elliptic or oblong, 5–10 cm long, 1.8–5.0 cm wide, bluntly short-acuminate, acute and decurrent at base; petioles 0.3–0.8 cm long; stipules connate into a triangular axillary ligule, 2.0–2.5 mm long. *Pseudoracemes* terminal, to 8 cm long; axis, pedicels, bracts, and sepals ferruginous appressed-pubescent; bracts ovate, 1.5–2.0 mm long; bracteoles narrowly ovate, ca. 1.5 mm long; pedicels to 8 mm long. *Flowers* many, pink, ca. 1.5 cm in diam.; sepals 5, triangular, ca. 2.2 mm long, 2.5 mm wide, each bearing 2 oblong glands which are reflexed at the apex; petals 5, pink, glabrous, clawed, the blade suborbicular, ca. 6 mm in diam., concave, the margin irregular; stamens 10, subequal, the filaments ca. 1.8 mm long, pilose at the base, the anthers introrse, non-alate, ca. 1 mm long, the connective with a thickened, long, exserted appendage; ovary glabrous, ca. 2 mm long, the styles 3, distinct, ca. 3 mm long. *Drupes* ovoid, ca. 1 cm long, green (immature).

This species has been found in flower from December to March and with large green fruits in March.

Byrsonima dressleri was originally described as having free stipules. Examination of many specimens, including type specimens of this taxon, showed that the pairs of stipules are connate and axillary. The only differences seen between the Panamanian population and the typical *B. nemoralis* from the Colombian Pacific coast are found in the size of the leaves, which are somewhat larger in the Colombian plants, and in the indument on the rachis and pedicels. This pu-

bescence in typical *B. nemoralis* is sparingly appressed or subappressed, whereas in the Panamanian plants it is more dense and spreading, especially in older specimens. The abundant collections at hand from Panama show a broad range of variation suggesting that *B. dressleri* is best treated as a subspecific population of higher altitude and dryer habitat than the lowland *Byrsonima nemoralis* ssp. *nemoralis*.

Byrsonima nemoralis is known from Panama and northern Colombia on the Pacific slope. The variety *dressleri* is endemic to the region of Cerro Jefe in Panama Province.

PANAMÁ: Cerro Jefe, *Busey & Croat 274* (DUKE, GH, MO, NY, US); *Gentry 2872* (DUKE, MO, PMA, NY), *6772* (MO); *Lewis & Dressler 7547* (DUKE, F, GH, MO, NY, PMA, US). Cerro Azul, *Mori & Kallunki 2208* (MO), *4932* (MO, PMA, US). WITHOUT LOCALITY: *Lewis & Dressler 7548* (MO).

3. **Byrsonima spicata** (Cav.) H.B.K., Nov. Gen. Sp. Pl. 5: 147. 1822.—FIG. 4.

Malpighia spicata Cav., Diss. 8: 49. *tabl 237.* 1789. TYPE: Hispaniola (not seen).
Byrsonima coriacea (Sw.) Kunth var. *spicata* (Cav.) Niedenzu, Malpigh. (Pflanzenr. 141(94):) 700. 1928.

Tree, 4–22 mm tall, the trunk to 40 cm d.b.h; outer bark thin, light brown with many minute fissures; inner bark brownish-red, moderately thick; young parts ferruginous, appressed-pubescent. *Leaves* opposite, elliptic-oblong, acuminate, acute and decurrent at the base, 5–14 cm long, 1.5–4.5 cm wide, glabrate or sparsely pubescent below and on midrib above in age; petioles 5–10 mm long; stipules narrowly triangular, ca. 3 mm long. *Pseudoracemes* terminal, 6–10 cm long, shorter than the leaves; rachis angular, ferruginous appressed-pubescent; bracts ovate-lanceolate or linear, 1.5–3.0 mm long, ferruginous-pubescent outside; bracteoles lanceolate, 1.0–1.5 mm long; peduncles and pedicels densely ferruginous-tomentose. *Flowers* many, ca. 1.5 mm in diameter, yellow; sepals 1.5–2.0 mm long, usually each with 2 glands, the glands oblong-obovate, yellow; petals subequal, suborbicular, concave, clawed, 4–6 mm in diam., subentire, 1 petal flat, somewhat thicker and more erect than the others; stamens 10, in 2 series, nearly erect, 3.0–3.5 mm long, the filaments pubescent from the base, nearly as long as the anthers, the anthers ca. 2.5 mm long, introrse, the connective swollen slightly surpassing the apex; styles 3, narrowly pointed, distinct, slightly longer than the stamens, persisting in fruit. *Drupes* more or less globose, ca. 10 mm in diam., glabrous, green to yellow or yellow-orange at maturity; seeds 3.

This species flowers from June to August. Fruits mature from August to October.

Niedenzu (1928, p. 700) made *Byrsonima spicata* a variety of *B. coriacea* (Sw.) DC., but as stated by Cuatrecasas (1958, p. 602), these two species are quite distinct. *Byrsonima coriacea* is restricted to Jamaica, and its relationships are rather with *B. crassifolia*; both are readily distinguished from *B. spicata* by the lanugineous indument.

Byrsonima spicata ranges from Costa Rica to Colombia and Venezuela, and in the West Indies. In Panama, it is known from tropical moist and tropical wet forests.

FIGURE 4. *Byrsonima spicata* (Cav.) H.B.K.—A. Flowering branch (×½).—B. Fruit (×4). [After *Hayden 140* (MO).]

CANAL ZONE: Road K-6 E of Arraiján, *Croat 15040* (DUKE, F, GH, MO, NY, PMA, SCZ, US). 2 mi S of Fort Sherman, *Johnston 1609* (MO), *1677* (A, GH, MO). Pipeline Road, *Mori & Kallunki 2407* (GH, MO, PMA, US). Cerro Pelado, 1 km N of Gamboa, 200–220 m, *Nee 7427* (BAA, BISH, BRNO, CAS, COL, DAV, F, FLAS, GH, H, MO, NY, PMA, RSA, U, US, VEN). BARRO COLORADO ISLAND: *Aviles X-2* (F, MO), *926* (F); *Croat 6120* (F, MO, NY, SCZ), *11133* (DUKE, MO, NY, PMA); *Foster 1118* (DUKE, F, MO, PMA); *Hayden 140* (GH, MO); *Shattuck 926* (MO); *Starry 129* (F, MO). COCLÉ: La Mesa N of El Valle, 1000 m, *Allen 2492* (MO, NY, US), *2568* (MO, US). COLÓN: Salúd, *Lao & Holdridge 251* (MO, PMA); *Howell 137* (PMA). Santa Rita Ridge trail, 17–35 km from Boyd-Roosevelt Highway, 400–800 m, *Mori & Crosby 6299* (MO, PMA). DARIÉN: Canglon, *Duke & Bristan 354* (MO). La Palma, 0–50 m, *Pittier 6965* (GH, NY, US). Shores of Bahía de Pinas, *Stern & Chambers 191* (F, GH, MO, NY, US). PANAMÁ: Near Panama City, *Hayes 349* (MO). 16–20 km above El Llano on Cartí Tupile Road, 400 m, *Kennedy 2699* (MO, US). El Llano Cartí road 21.1 km

from Panamerican Highway, 350 m, *Mori & Kallunki 5107* (CAS, DUKE, F, MO, NY, PMA, US). SAN BLAS: Playon Chico, 50 ft, *Lao & Gentry 538* (DUKE, F, MO, NY, PMA).

4. GALPHIMIA

Galphimia Cav., Icon. 5: 61. *tab. 489.* 1799. TYPE: *Galphimia glauca* Cav.

Subshrubs or *shrubs*, rarely *trees*. *Leaves* membranaceous or subcoriaceous, decussate, petiolate or sessile, usually glandular, ovate to elliptic to linear, usually glabrous with 2 sessile marginal glands near the base; petioles sometimes biglandular; stipules axillary, persistent, linear to triangular, inserted to the base of the petiole. *Inflorescences* terminal, racemiform or sometimes paniculate or corymbiform, laxly few flowered to densely many flowered, bracteate and bibracteolate, pubescent to glabrous; pedicels slender, erect, articulated above the bracteoles. *Flowers* zygomorphic to actinomorphic; calyx deeply 5-parted, eglandular or 5-glandular; petals glabrous, clawed, usually unequal, yellow; stamens distinct to connate, usually glabrous, the anthers usually basifixed, glabrous, lacking appendages, the connective uniform; ovary sessile on the disc, subglobose, usually angular, usually 3-carpellate, 3-locular, the styles usually 3, terminal, persistent in fruit; receptacle glabrous. *Capsule* usually angular-subglobose, glabrous, the lobes weakly ribbed, tardily medially and loculicidally dehiscent; seed 1 per carpel, pendulous; embryo folded, cotyledons incumbent, subequal.

A genus of 10 species, *Galphimia* ranges from Texas to Argentina occurring in drier habitats. One species, *G. gracilis* is widely cultivated for ornament. See MacBryde (1970).

Literature:

MacBryde, B. 1970. A revision of the Galphimiinae Niedenzu (Malpighiaceae). Ph.D. Dissertation, Washington Univ., 1970. 248 pp.

1. **Galphimia gracilis** Bartl., Linnaea 13: 552. 1839. NEOTYPE: herb. Jussieu (P-JU 11510, not seen; MO, microfiche).—FIG. 5.

Thryallis gracilis (Bartl.) Kuntze, Rev. Gen. Pl. 1: 89. 1891.
Galphimia gracilis var. *gracillima* Hieron., Bot. Jahrb. Syst. 20 (3) Beibl. 49: 36. 1895. TYPE: *Lehmann 7439* (F, lectotype; GH, US, isolectotypes).
Thryallis montana Rose, Contr. U.S. Natl. Herb. 12: 281. 1909. TYPE: Mexico: Durango, *Rose 2309* (US-301220, holotype; NY, isotype).
Galphimia glauca Cav. fo. *parviflora* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 5: 25. 1914. TYPE: Mexico, *Pringle 9608* (NY, lectotype; F, GH, MO, NY, US, isolectotypes).
G. montana (Rose) Niedenzu, Malpigh. (Pflanzenr. 141(94):) 601. 1928.

Shrubs, 0.6–2.0(–4.0) m tall, the branches dark to pale brown, usually sparsely to densely subappressed, reddish-brown hirsute, glabrate in age. *Leaves* opposite, lanceolate to ovate or elliptic-oblong, usually acute to obtuse at the apex, obtuse to acute at the base, 1–6(–8) cm long, 0.4–3.2 cm wide, subchartaceous to subcoriaceous, glabrous or nearly so above, beneath the midrib pubescent as the petiole, sometimes bearing 2 or 4 usually sessile glands near the base; petioles 2–15 mm long, pubescent; stipules triangular to subulate, 1.2–3.5 mm long. *In-*

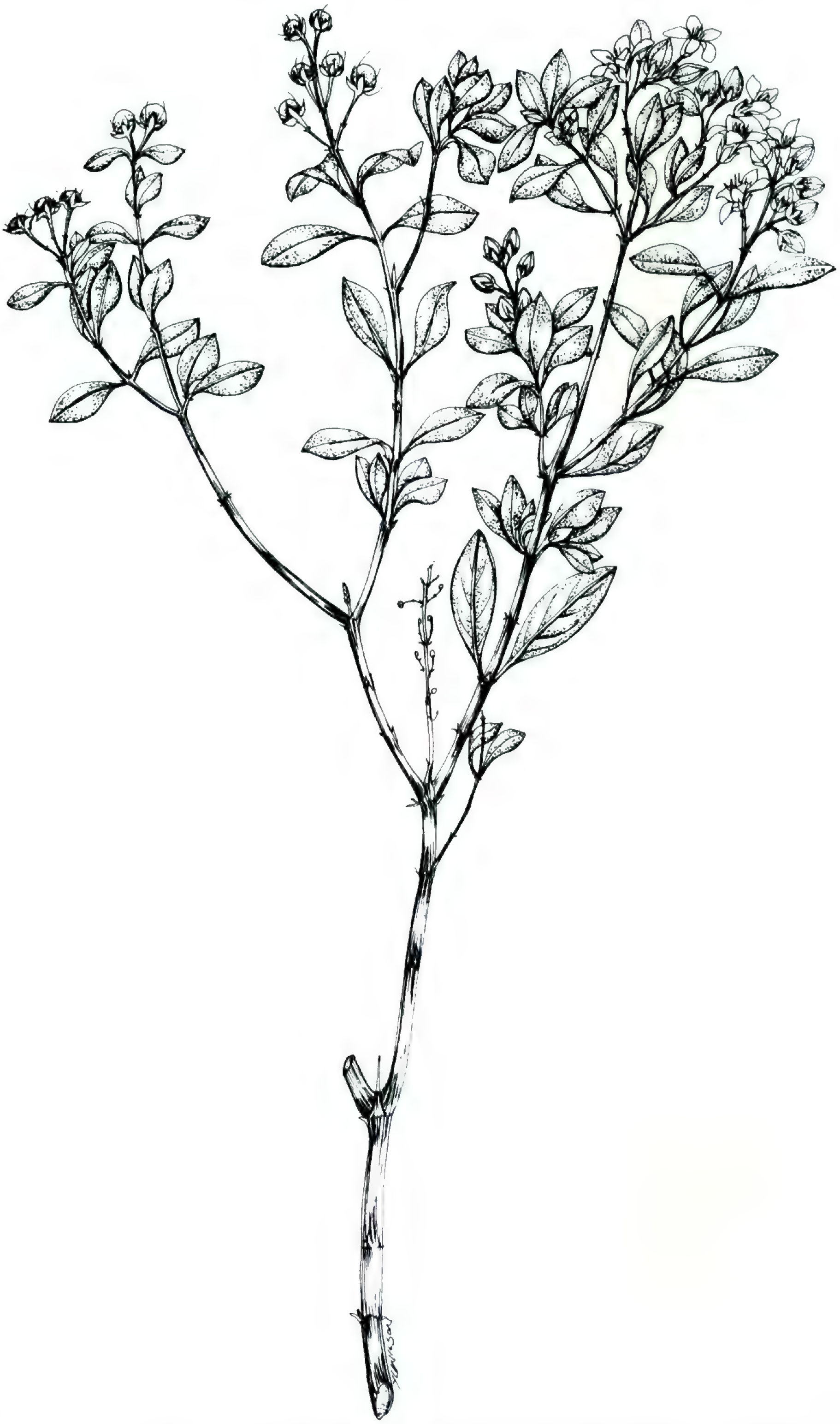

FIGURE 5. *Galphimia gracilis* Bartl. Branch with flowers and fruits (×4/5). [After *Folsom 3127* (MO).]

florescences terminal, pseudoracemose or corymbiform, usually pubescent like the stem; flowers each subtended by a lanceolate to subulate bract 1.4–3.1 mm long and 2 bracteoles 0.7–2.0 mm long; pedicels 6–17 mm long, pubescent. *Flowers* 1.4–2.2 cm diam.; calyx segments usually eglandular, usually 3–4 mm long, ca. 1 mm wide, obovate-oblong to lanceolate, obtuse to subacute at the apex, glabrous or somewhat ciliate; petals clawed, yellow, costate to subcarinate on the lower surface, the claw flattened, 1.3–3.0(–5.0) mm long, frequently reddish in age, the limb ovate to ovate-oblong, 5–9 mm long, subentire and frequently ciliolate, the anterior petal 5.5–7.5 mm long, the claw stouter, the limb broadly ovate to subdeltoid, the base sometimes cordate, the apex subcucullate; stamens with filaments flattened, subdistinct to connate, subequal, the anthers 2–3 mm long; ovary subglobose, 1.8–2.4 mm diam., usually glabrous, the styles slender, unequal, 4–7 mm long, the anterior style usually slightly shorter. *Capsule* subglobose, 4.5–6.0 mm diam., usually glabrous, the lobes tardily dehiscent; seeds ovoid to subglobose, reddish-brown.

The species is recognized by its small habit, small leaves, and yellow flowers with eglandular sepals. It does not look much like the other Malpighiaceae which occur in Panama.

According to MacBryde (1970) the species is probably native only to Mexico, but it is widely cultivated in the New World tropics, especially in the West Indies.

COCLÉ: El Valle, end of road to Turistico Hotel, *Folsom 3127* (MO). LOS SANTOS: La Laja de Las Tablas, cult., *Carrasquilla 175* (F, MO, PMA). PANAMÁ: Cultivated shrub in Panama City, *Correa 486* (DUKE, MO, PMA, SCZ).

5. HETEROPTERIS

Heteropteris H.B.K., Nov. Gen. Sp. Pl. 5: 163. *tab. 450.* 1822. TYPE: *H. purpurea* (L.) H.B.K., typ. & nom. cons.

Banisteria L., Sp. Pl. 427. 1753. Gen. Pl., ed. 5. 195. 1754. TYPE: *B. brachiata* L. Nom. rejic. vs. *Heteropteris* H.B.K.

Twining *shrubs, lianas* or rarely suffruticose and erect; branches often with abundant lenticels. *Leaves* opposite, coriaceous, chartaceous or membranaceous, petiolate with sunken or stalked glands; stipules obsolete. *Inflorescences* cymose-paniculate, generally thyrsoid with the ultimate branches arranged in cymes, umbels or racemes; pedicels pedunculate or sessile; bracts and bracteoles conspicuous. *Flowers* with the calyx of 5 sepals more or less united at the base, 4 generally biglandular, sometimes all eglandular; petals yellow, pink or white, clawed, the limb orbicular or oblong, entire or slightly denticulate, the base obtuse, truncate or sagittate; stamens 10, glabrous, somewhat unequal, the 5 episepalous stamens larger, the filaments glabrous, flattened, united at the base, the anthers ellipsoid, subglobose or oblong, uniform, all fertile, glabrous or rarely pilose; styles free, erect, thick, glabrous, or somewhat pilose at the base, truncate at the apex with the internal angle stigmatic, the abaxial angle obtuse, acute or apiculate the ovary trilobate or trigibbose, tomentose or hirsute. *Fruit* a schizocarp of 2 or 3 samaras, the dorsal wing well developed, membranaceous or coriaceous, its dorsal margin thickened, the ventral margin thin; body smooth or with short crests.

Heteropteris is a genus of approximately 100 species all from tropical America with the exception of a single species, *H. africana*, from West Africa.

Niedenzu (1928) divided the genus into two subgenera: 1. *Anosepalis* with erect sepals. 2. *Euheteropteris* with sepals revolute at apex.

a. Sepals erect, straight; petioles glandular or eglandular.
  b. Leaves glabrous, elliptic, 14–16 × 6.5–8 cm, rigid, chartaceous ---------- 2. *H. buricana*
  bb. Leaves conspicuously pubescent beneath.
    c. Trichomes on both leaf blade surfaces spreading, flexuose, lanugineous ---------- 1. *H. beecheyana*
    cc. Trichomes on the leaves straight, appressed.
      d. Petals pink; trichomes of lower blade surfaces scarcely if ever contiguous along most of their length, the leaf surface easily visible, the major veins yellow mostly glabrous ---------- 7. *H. panamensis*
      dd. Petals yellow, trichomes of lower blade surfaces contiguous throughout their length, the leaf surfaces completely covered by the indument, not visible, the major veins densely covered with trichomes like the leaf surfaces.
        e. Pedicels articulate to a peduncle, bibracteolate at apex; petioles with a pair of glands at the middle; blades firmly coriaceous ---------- 4. *H. macrostachya*
        ee. Pedicels sessile, not articulate; petioles with a pair of glands appressed at the base; blades chartaceous, thinner ---------- 6. *H. obovata*
aa. Sepals recurved at apex; petioles eglandular.
  f. Samaras narrowly elliptic to subobovate, membranaceous, more than 4 times longer than broad; leaves usually less than 17 cm long and 6 cm wide; petioles 3–7 mm long ---------- 3. *H. laurifolia*
  ff. Samaras reniform to semidiscoid, suberous coriaceous, less than 1.5 times longer than broad; leaves frequently more than 17 cm long and 6 cm wide; petioles 7–12 mm long ---------- 5. *H. multiflora*

1. **Heteropteris beecheyana** Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 278. 1840. TYPE: Mexico, *Linden 909* (not seen).

H. rubiginosa Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 324. 1862, non Juss. TYPE: Colombia: Llano de San Martin, bassin du Meta, 200–350 m, *Triana* (syntype, not seen); Agua Chica alt. 1625 m, *Schlim 265* (syntype, not seen).

H. loniceraefolia Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 322. 1862. TYPE: Colombia: Cundinamarca, Caqueza, 1700 m, *Triana 6386* (P, lectotype; F, fragment of type; COL, isolectotype; F, photo of isotype at G, FM 24259).

Banisteria beecheyana (Juss.) C. B. Robinson in Small, N. Amer. Fl. 25: 134. 1910.

Liana; the stems densely reddish-brown tomentose when young, sparsely pubescent to glabrous in age, densely and minutely lenticellate. *Leaves* opposite, ovate to ovate-elliptic, obtuse to rounded and apiculate at the apex, obtuse to rounded at the base, 1.5–7 cm long, 0.9–4 cm wide, sparsely villous to scabrid above, often rugose with the reticulate veins impressed, reddish-brown to white lanugineous beneath with dark stalked, plate-shaped glands to ca. 1 mm diam. on the lowermost lateral veins, the midrib sunken above, the major lateral veins 3–5 pairs, arising mostly from below the middle; petioles 3–6 mm long, glabrate to lanugineous. *Inflorescences* terminal, the axis, peduncles and pedicels densely brown tomentose; peduncles 0.5–2 mm long, the pedicels to ca. 3 mm long. *Flowers* pinkish; calyx lobes erect, narrowly ovate-triangular, biglandular, to ca. 1.5 mm long, the glands less than 1 mm long; petals clawed, glabrous, to 4 mm long, the blade longer than broad, entire; stamens glabrous, to 3.3 mm long, united to about midway, glabrous, the anthers ca. 1 mm long; pistil to 3.3 mm long, the ovary villous, the styles glabrous, to 2 mm long. *Samaras* reddish

brown, 1.5–2.6(–4) cm long, 7–9(–14) mm wide, the wing inconspicuously appressed-pubescent, the dorsal margin thickened, mostly straight; body densely dark reddish-brown patulous pubescent, bearing a pair of lateral wings or tubercles, one on either side, 1–3 mm long.

The species can be distinguished by its small leaves with spreading pubescence on both surfaces. In Panama, the species flowers and fruits in the dry season, mostly in February and March.

Heteropteris beecheyana ranges from Mexico to Bolivia.

It is known in Panama from dryer parts of tropical moist forest.

CHIRIQUÍ: San Felix, 0–120 m, *Pittier 5130* (F, NY, US). HERRERA: Las Minas, La Peña, *Stern et al. 1776* (MO, US). Las Macaracas, trail between Río Las Trancas and Las Minas, *Stern et al. 1811* (MO, US). VERAGUAS: At Cañazas, *Tyson 3654* (MO, SCZ).

2. **Heteropteris buricana** Cuatr. & Croat.[7] TYPE: Panama; *Croat 21998* (MO-2164094, holotype; K, PMA, US, isotypes).

Liana; stems inconspicuously puberulous, glabrous, weakly lenticellate. *Leaves* opposite, elliptic to ovate-elliptic, acuminate at the apex, rounded to obtuse at the base, 14–16 cm long, 6.5–8 cm wide, thinly chartaceous, glabrous on the upper side, glabrate beneath, the midrib sunken on the upper side; major lateral veins 5 or 6 pairs, arcuate-ascending, faintly loop-connected toward the apex; petioles 1–1.5 cm long, bearing 2 pairs of small glands. *Inflorescences* terminal, the umbels arranged in racemes, the branches, peduncles and pedicels densely and shortly reddish-brown tomentose; peduncles to ca. 3 mm long; pedicels to ca. 1 cm long (in fruit), articulate. *Flowers* not known; fruiting calyx with glands oblong, to ca. 4 mm long. *Samaras* (3.5–)4.5–5.8 cm long, 1.5–2.1 cm wide, well attenuated toward the base, weakly appressed-pubescent to glabrous, the pubescence denser on the dorsal margin and on the body, the dorsal thickened margin straight or slightly curved, the ventral margin thin, gradually curved to the base, usually with a prominent lobe near the base, the body 7–8 mm long, semi-obovoid, dark reddish-brown, transversely ridged about midway with smaller longitudinal ridges.

The species is recognized by its essentially glabrous leaves.

It is known only from the type locality, an area of tropical wet forest. Mature-sized fruits were collected in February.

CHIRIQUÍ: Burica Peninsula, 10–11 mi W of Puerto Armuelles, San Bartolo Limite, 300–500 m, *Croat 21998* (K, MO, PMA, US).

3. **Heteropteris laurifolia** (L.) Juss., Malpigh. Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 276. 1840.

Banisteria laurifolia L., Sp. Pl. 1: 611. 2 ed. 1762. TYPE: Jamaica, *Sloane* (not seen).

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[7] *Heteropteris buricana* Cuatr. & Croat, spec. nov. A species colombiana *H. uribei* Cuatr. affinis, *H. buricana* differt: pedicelli longiores cum pedunculi articulati. Folia chartacea tenuiora. Samarae nux brevior, conspicue nervata, breviter pubescens; ala dorsali basim versus bene attenuata, semi-obovata; areola ventrali subrotunda.

B. coerulea Lamarck, Encycl. Bot. 1: 367. 1783. TYPE: not seen.
B. macradena DC., Prodr. 1: 590. 1824. TYPE: French Guiana (not seen; F, photo FM 33404).
B. ?orinocensis H.B.K., Nov. Gen. Sp. Pl. 5: 162. 1822. TYPE: Venezuela, River Orinoco, *Humboldt & Bonpland* (P).
B. floribunda H.B.K., Nov. Gen. Sp. Pl. 5: 166. 1822. TYPE: Mexico, Venta del Exido, *Humboldt & Bonpland* (P).

Liana or climbing shrub (rarely elsewhere a small tree or shrub); young stems and petioles densely short appressed-pubescent. *Leaves* oblong-elliptic, acuminate, acute to obtuse at base, 10–17 cm long, 3.5–6(–7.5) cm wide, glabrate, sometimes with small glands near the margin at the base; petioles to 1.2 cm long, eglandular. *Inflorescences* paniculate, solitary, terminal or upper axillary to 12 cm long; inflorescence branches, pedicels and sepals with dense, ferruginous, T-shaped trichomes. *Flowers* 9–13 mm wide; sepals lanceolate to oblong, recurved at apex, eglandular or with glands covering the lower ½, 2.5–4 mm long; petals yellow, clawed, 4–5 mm long, glabrous; stamens 10, 3–4 mm long, equal, enlarged and fused at base, the anthers ca. 1 mm long; styles 3, distinct, truncate at apex, its adaxial angle stigmatic, acute, the abaxial angle apiculate about equalling the stamens. *Samaras* membranaceous, ferruginous-tomentose, especially the body, 2–3 cm long, narrowly elliptic to subobovate, the dorsal margin almost straight, the ventral margin slightly undulate, narrowed near the base, with a small protrusion on the apical end near the body.

In Panama the species flowers mostly from January to May with fruits maturing from March to June. Flowering may occur as early as November and as late as July. Fruits may mature as late as August.

Heteropteris laurifolia is a polymorphic, widespread species from Mexico, the Caribbean islands and northern South America to Brazil, Peru and Bolivia. In Panama it is known mostly from tropical moist forest but is rarely also found in tropical dry forest and tropical wet forest (*Barclay 2824* from Bahia Honda in Veraguas). *Heteropteris laurifolia* has close relationships with other species, e.g. *H. acutifolia* Juss., *H. nervosa* Juss., *H. suberosa* Griseb., *H. lessertiana* Juss., and *H. anoptera* Juss., which may well represent slight variations of *H. laurifolia*. There are forms with glandular calyces and others without them, but this feature does not have taxonomic value in this species complex. The specimens may be mentioned merely as form *glandulosa* or *eglandulosa* accordingly.

Johnston (1949) reported that on San José Island, roots of the species develop globose or broadly elliptic storage tubercles as much as a meter below ground.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 1159, 1480, 1683, 1805, 2146* (all GH, MO, US). CANAL ZONE: Madden Forest, *Croat 14094* (MO, SCZ). Near Gatún, *Hayes 1002, 1003* (NY). Summit Garden, *Lindsay 321* (MO, US). End of Pipeline Road 19 km NW of Gamboa, *Nee 11072* (PMA, US). Macapalé Island in Madden Lake, *Tyson 5471* (MO, SCZ). BARRO COLORADO ISLAND: *Croat 4773, 4774* (both MO, SCZ), *5122, 5155* (both MO, PMA, SCZ), *8286, 9550* (both MO, NY, SCZ); *Foster 2294, 2326* (both GH, NY, PMA); *Woodworth & Vestal 695* (A, F, MO). COCLÉ: Penonomé, 50–1000 ft, *Williams 86, 390* (both NY, US). COLÓN: Santa Rita Trail, *Cowell 102* (NY). LOS SANTOS: Between Tonosí and Jobero 50–80 m, *Croat 34444* (MO). Tonosí, Guanaco, *Stern et al. 1847* (MO). PANAMÁ: Pacora, 0–20 m, *Allen 3447* (F, GH, MO, NY, US). Río Maje, ca. 4–5 mi above waterfall near new Bayano Lake, 100 m, *Croat 34663* (MO). San José Island, *Erlanson 157* (GH, US). Río Bayano, E of Río Espave, *Gentry 4993* (GH, MO). San José Island, *Johnston 528, 705, 729, 765, 1080* (all GH, MO, US). Taboga Island, *Miller 2033* (US). Savannas N of Panama City, *Paul 402, 435* (F, US). Experimental Center of Tocumen, *Pereira 55* (MO, PMA). SAN BLAS: Mulatuppu, Río Ibedi, *Duke 8455* (MO, OS). VERAGUAS: Bahía Honda, *Barclay 2824* (F, MO, NY, US).

3a. **Heteropteris laurifolia** var. **brevibracteolata** Cuatr. & Croat.[8] TYPE: Panama; *Dwyer & Correa 8412* (MO-2219104, holotype; PMA, isotype).

Liana; stems to 5 cm diam., minutely and densely lenticellate, dark reddish-brown, appressed-puberulent when young, becoming glabrate, the interpetiolar ridges moderately conspicuous. *Leaves* drying dark brown, oblong-elliptic, acuminate at the apex, obtuse to acute at the base, 6–17 cm long, 2.2–5.5 cm wide, glabrous above or inconspicuously appressed-puberulent along the midrib, the lower surface densely and inconspicuously pubescent with numerous minute, appressed, T-shaped trichomes, the midrib in part densely ferruginous with appressed trichomes; petioles 6–13 mm long, densely appressed-puberulent. *Inflorescences* axillary, the umbels arranged in racemes; the axis, peduncles, pedicels and calyces densely dark reddish-brown appressed-puberulent; axis conspicuously flattened; peduncles 1.5–2 mm long; pedicels 6–8 mm long; bracteoles oblong, ca. 1 mm long, inconspicuously appressed-pubescent. *Flowers* yellow; calyx lobes ovate, biglandular, recurved at the apex, the inner surface glabrous; petals clawed, to 4 mm long, the blade to ca. 2.5 mm wide, irregular; stamens unequal, glabrous, the longest to 2.5 mm long; pistil to 3.3 mm long, the ovary ovoid, densely reddish-brown villous, the styles to 2 mm long, glabrous. *Fruits* unknown.

This variety is known only from the type which flowered in January. The type locality is an area of tropical moist forest. The variety *brevibracteolata* differs from the typical variety in drying dark reddish-brown, in having more sparsely pubescent, dark reddish-brown inflorescences, minute, sparsely pubescent bracteoles and more slender, proportionately longer pedicels.

CANAL ZONE: Between Chilibre and Madden Dam, *Dwyer & Correa 8412* (MO, PMA).

4. **Heteropteris macrostachya** Juss., Malpigh. Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 275. 1840. TYPE: Guiana, Herb. Richard (P, not seen; F, photo FM 35589).

H. apiculata Miq., Stirp. Surinam Sel. 81. 1851. TYPE: Surinam, Fl. Marowyne, *Kappler 1915* (not seen; F, type photo FM 12768).
Banisteria apiculata (Miq.) C. B. Robinson ex Small, N. Amer. Fl. 25: 136. 1910.

Liana; stems densely pale reddish-brown, pubescent when young, glabrescent, weakly lenticellate. *Leaves* opposite, elliptic to lanceolate, gradually to abruptly acuminate at the apex, obtuse to rounded at the base, (4–)8–15 cm long, (2.5–)4–7 cm broad, firmly coriaceous, glabrous and semi-glossy above, pale and tan or golden sericeous beneath, the lower surface sometimes with glands near the base; petioles 5–11 mm long, canaliculate, densely and obscurely appressed-pubescent, bearing 1 or 2 pairs of conspicuous plate-shaped glands on the margins. *Inflorescence* terminal or upper axillary, paniculate, the branches to 15 cm long, the branches, peduncles, pedicels and calyces reddish-brown, tomentose;

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[8] *Heteropteris laurifolia* var. *brevibracteolata* Cuatr. & Croat var. nov. A *H. laurifolia* (L.) Jussieu differt: bracteae bracteolaeque minutae circa 1 mm longae. Pedicelli teneri 6–8 mm longi quam pedunculi (1.5–2 mm) triplo vel ultra longiores. Flores ad racemos umbellati. Folia abaxiale adpresse minute puberula. Inflorescentiae indumento densiusculo sed minuto.

peduncles to ca. 7 mm long, bibracteolate at the apex, the bracteoles pubescent, stiffly erect, to ca. 1 mm long; pedicels less than 2 mm long, articulate to the peduncle. *Flowers* ca. 1 cm diam., calyx lobes erect, narrowly ovate, 4 of them bearing conspicuous fleshy, gray glands, 2–3 mm long, glabrous on the outside, the thin surface rupturing, at least on drying, densely puberulent within; petals yellow, oblong-elliptic, 3.5–4 mm long, 2.2 mm wide, stamens to 3 mm long, the staminal tube glabrous to sparsely villous, the free part of the filaments less than 1 mm long, the anthers ca. 1 mm long; styles to ca. 2 mm long, glabrous, the apex truncate, triangular, the ovaries ovoid, 2–4 mm long, densely reddish-brown pubescent.

According to Johnston (1949) on San José Island the species does not produce a typically samaroid fruit. He reported that the wingless ovaries probably act as a fruit.

The species is most easily confused with *H. obovata* with which it shares a thick sericeous indumentum on the lower blade surface. It is distinguished from *H. obovata* by having thicker leaves with petioles bearing a pair of glands at the middle and by having short pedicels articulated with a bibracteolate peduncle. The pedicels of *H. obovata* are sessile, not borne on a bibracteolate peduncle.

In Panama, the species flowers from October to January but also has been collected in July on Coiba Island.

Heteropteris macrostachya ranges from the southern West Indies to northern South America. In Panama the species is known only from tropical moist forest on the Pacific slope.

DARIÉN: Between Río Punusa and Río Pucro, *Duke 14643* (MO, OS, PMA, US). PANAMÁ: El Llano, *Duke 5845* (MICH, MO). Cerro Azul, 20 km from Panamerican Highway, *Dwyer 2208* (MO, US). San Jose Island, *Johnston 388, 1039, 1377* (all GH, MO, US). VERAGUAS: Isla Coiba, Campaguja, *Dwyer 2369, 2382* (both DUKE, MO). Playa Rosario, northern tip of Coiba Island, *Foster 1595* (MO, PMA).

5. **Heteropteris multiflora** (DC.) Hochreutiner, Bull. New York Bot. Gard. 6: 277. 1910.

Malpighia reticulata Poir., Encycl. Méth. Bot. Suppl. 4: 8. 1816. TYPE: French Guiana, Caieture, Herb. Poir. "in herb. Moquin-Tandon" (P, lectotype, not seen; F, photo FM 35592).
Byrsonima reticulata (Poir.) DC., Prodr. 1: 581. 1824.
Banisteria multiflora DC., Prodr. 1: 589. 1824. TYPE: French Guiana (not seen; F, photo FM 33400).
Heteropteris platyptera Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 276. 1840, non DC. TYPE: not seen.
H. reticulata (Poir.) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 2: 54. 1903, non Grisebach.

Shrubby *liana, shrub* or small *tree* to ca. 7 m tall; the stems densely reddish-brown appressed-pubescent when young, becoming glabrous or nearly so, smooth or conspicuously and sparsely lenticellate. *Leaves* opposite, oblong, oblong-elliptic or ovate-oblong, acuminate at the apex, obtuse to rounded at the base, 11–35 cm long, 5–10 cm wide, moderately thick, drying brown, glabrous above, glabrous to minutely appressed-pubescent beneath, major lateral veins 9–14 pairs, the reticulate veins prominulous on the lower surface; petioles 7–10 mm long, canaliculate on upper side, minutely wrinkled on drying. *Inflorescences* terminal, paniculate, the axils, peduncles, pedicels and calyces densely reddish-brown ap-

pressed-pubescent; branches often prominently flattened; peduncles to 3.7 mm long, weakly flattened, bibracteolate at the apex, the bracteoles ovate, to 3 mm long, densely appressed-pubescent on both sides; pedicels to 2.3 mm long. *Flowers* yellow, the buds to 3.3 mm long; calyx lobes recurved, glabrous within, biglandular, the glands oblong, to 2.3 mm long; stamens to 3 mm long, glabrous, the styles slightly longer than the stamens, glabrous the apex in two of them apiculate at the abaxial angle, in the third hooked. *Samaras* reddish, densely reddish-brown appressed-pubescent, with short T-shaped trichomes, the wings thick, suberose-coriaceous, broadly flabellate-trapezoidal to semidiscoid or reniform, to 5.8 cm long, 3.5 cm wide, the ventral margin rounded, slightly denticulate, the dorsal margin concave, thickened except at the apex, the body much thickened, to 2.7 cm long, 2 cm wide.

The species flowers in Panama from the late rainy season to the early dry season from October to February. *Fruits* mature during the dry season beginning about February.

Heteropteris multiflora is recognized by its large leaves and large semidiscoid to reniform fruits.

It ranges from Panama to Colombia and the Guianas.

In Panama it is known only from tropical moist forest on the Atlantic slope.

BOCAS DEL TORO: Old Bank Island, Chiriquí Lagoon, *Wedel 2027* (GH, MO, US). PANAMÁ: Chagres, *Fendler 46, 309* (both GH, MO, US). SAN BLAS: Between Mandinga and Cangandí, *Duke 14724* (MO, OS).

6. **Heteropteris obovata** (Small) Cuatr. & Croat, comb. nov.

Banisteria obovata Small, N. Amer. Fl. 25: 136–137. 1910. TYPE: Costa Rica, near Nicoya, *Tonduz 13478* (US, holotype).
Spachea sericea Kuntze, Rev. Gen. Pl. 1: 68. 1891. TYPE: Panama, *Kuntze* 8-6-1884 (not seen).
Banisteria kuntzei Small, N. Amer. Fl. 25: 137. 1910. Based on *Spachea sericea* Kuntze.
B. hyposerica Standley & L. O. Williams, Ceiba 3: 50. 1952. TYPE: Honduras, Morazan, below Suyapa 1100 m, *Molina 14924* (US, isotype).

Liana; stems densely reddish-brown appressed-pubescent, becoming glabrate. *Leaves* opposite, elliptic to obovate-elliptic, acuminate at the apex and usually narrowed to a sharp apiculum, acute at the base, 5–13 cm long, 2–7.5 cm wide, glabrous on the upper surface, minutely muricate, the lower surface minutely muricate and whitish to brownish sericeous, frequently glandular, the trichomes usually of 2 types, the surface completely covered with fine, sessile, T-shaped trichomes to ca. .7 mm long and with sparse, to 1 mm long, stalked hairs, with a thicker body, usually darker in color than the sessile trichomes; glands of lower surface few to absent, usually in a row ca. midway between the midrib and margin; petioles 3–13 mm long with a pair of small glands appressed at the base on the upper side. *Inflorescence* upper axillary or terminal, 4–18 cm long, the axis, peduncles, pedicels and calyx lobes densely reddish-brown appressed-pubescent; pedicels sessile, not articulate. *Flowers* yellow; calyx lobes ovate, erect, biglandular, to 2 mm long; petals obovate-spatulate, to 3.3 mm long, clawed, the margins entire to weakly toothed; stamens to ca. 3 mm long, the staminal tube glabrous, to 1.7 mm long, the anthers to 1.2 mm long; pistil to 3.3 mm long, the ovary ovoid, densely reddish-brown pubescent, the styles to 1.7 mm long, gla-

brous. *Samaras* brown, 3–4 cm long, glabrous to inconspicuously appressed-pubescent throughout; the body ovoid-ellipsoid, to ca. 1 cm long, the dorsal margin straight, thickened, the wing 12–14 mm wide near the apex, constricted in the middle to lower ⅓ becoming broader and ending abruptly near the base of the body.

In Panama the species flowers from June to August with fruits developing in the following dry season during December to February.

Heteropteris obovata ranges from Honduras to Panama.

In Panama the species occurs in tropical moist forest and premontane wet forest.

CANAL ZONE: Gamboa, 40–80 m, *Pittier 3706* (NY, US). Cerro Gordo near Culebra, 50–200 m, *Pittier 3733* (US). Las Cascadas Plantation near Summit, *Standley 29650* (US). CHIRIQUÍ: Trail from San Felix to Cerro Flor, 100–850 m, *Allen 1955* (GH, MO, NY, US). COLÓN: Border of the Canal Zone 2 mi from Achiote, *Folsom 3875* (F, MICH, MO, NY, PMA, US). DARIÉN: Mora Swamp ca. 4 mi downstream from El Real, *Duke 4950* (MO). Campamento Buena Vista, Río Chucunaque above confluence with Río Tuquesa near Quebrada Felix, *Stern et al. 950* (MO). LOS SANTOS: Canofistulo, *Dwyer 2462* (MO, US). VERAGUAS: Isla Coiba, *Dwyer 1602* (US).

7. **Heteropteris panamensis** Cuatr. & Croat.[9] TYPE: Panama, *Foster 4108* (MO, holotype; DUKE, PMA, US, isotypes).—FIG. 6.

Slender *liana*; the stems densely reddish-brown appressed-pubescent, becoming glabrate to glabrous and densely lenticellate in age. *Leaves* ovate to ovate-elliptic, acuminate to acute and glandular-tipped at the apex, acute to obtuse or almost rounded at the base, 2–9 cm long, 1.5–4 cm wide, the upper surface glabrous to sparsely pubescent with minute, whitish, T-shaped trichomes, the lower surface paler, densely pubescent with appressed, reddish-brown, T-shaped trichomes, also with scattered, plate-shaped glands along the margin in the distal ¼ of the blade; petioles 5–8 mm long, glandular or eglandular, densely appressed-pubescent. *Inflorescences* paniculate, terminal and on short axillary branches, to ca. 15 cm long, the rachises, peduncles, pedicels and calyces densely reddish-brown appressed-pubescent; peduncles to ca. 2 mm long, bibracteate at the apex, the bracts ovate, glabrous within, sparsely pubescent outside; the pedicels to 3 mm long at anthesis, to 5 mm long in fruit. *Flowers* pink; calyx lobes biglandular, 1.3–2 mm long, the glands dark, round or ellipsoid, contiguous, to ca. 1.5 mm long; petals pink, obovate, ca. 4 mm long, glabrous, entire, somewhat thickened medially; stamens to 3 mm long, the filaments glabrous, the lower ⅓–½ united; pistil to ca. 3 mm long, ovary densely reddish-brown pubescent, the styles glabrous, to ca. 2 mm long. *Samaras* reddish-brown, 2.5–3.5 cm long, 9–15 mm wide, the wing inconspicuously appressed-pubescent, the dorsal margin thickened, straight, the ventral margin thin, rounded, gradually narrowed to the body; body darker, densely patulous-pubescent, bearing 1 or more cristate, lateral appendages 2–4 mm long, if several one is usually broader with 1 or more narrower crests borne on its inner edge from near the base.

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[9] *Heteropteris panamensis* Cuatr. & Croat, sp. nov. A *H. beecheyana* Juss. differt: folia subtus, sicut rami, dilute adpresseque pilosula, pilis rubescentibus minutis sericeis rectis adpressis. Samarae nux 2–3 alatis brevibus transversis cristatis instructa. Ala dorsalis rubescens. Petala rosea.

FIGURE 6. *Heteropteris panamensis* Cuatr. & Croat. Fruiting branch (×9/10). [After *Dwyer & Gentry 9548* (MO).]

In Panama, the species flowers as early as October and fruits mature in the dry season from January to April. It is closely related to *H. beecheyana* and is distinguished by its appressed rather than patulous pubescence on its leaves. *Heteropteris beecheyana* has lanate pubescence with longer, flexuose, imbricate trichomes. In comparison to *H. beecheyana* which occurs in dryer parts of trop-

ical moist forest on the Pacific slope, *H. panamensis* occurs in areas of tropical wet forest and premontane rain forest. It is known only from Panama.

CANAL ZONE: Barro Colorado Island, *Foster 2818* (BCI, DUKE, F, MICH, MO, NY, PMA, RSA, US), *4108* (DUKE, MO, PMA, US). COLÓN: Santa Rita Ridge, *Dwyer & Gentry 9548* (MO). Several mi SE of Piña Base Camp, 600 ft, *Johnston 1801* (A, MO). PANAMÁ: Cerro Jefe, *Duke 9440* (MO, US); *Dwyer & Gentry 9502* (MO, NY). El Llano-Cartí road, 10–12 km from Panamerican Highway, 410 m, *Mori & Kallunki 2850* (MO, PMA, US, VEN).

6. HIRAEA

Hiraea Jacq. TYPE: *Hiraea reclinata* Jacq.

Lianas, rarely *shrubs* or climbing shrubs. *Leaves* opposite, rarely ternate (not Panama), simple, entire, petiolate or subsessile, coriaceous, chartaceous, or papyraceous; stipules conspicuous, adnate to the petioles. *Inflorescences* of simple, many-flowered umbels, or with the umbels arranged in cymose panicles; pedicels sessile, conspicuously bracteolate at the base. *Flowers* with the sepals ovate or ovate-oblong, 8–10, glandular or eglandular; petals clawed, yellow or white, rarely reddish (not Panama), generally glabrous, the limb suborbicular, obovate or ovate, concave, subentire, denticulate or shortly fimbriate, the fifth petal smaller, smooth, fimbriate or glandulose; stamens 10, somewhat unequal, glabrous, the filaments united at the base, the anthers ellipsoid or sometimes oblong; style glabrous with the apex truncate and the stigma lateral, erect, the apex scarcely thickened or more or less sigmoid with the apex dilated and the posterior angle apiculate, the ovary trilobate, hirsute. *Fruit* a schizocarp of 3 samaras, each with 2 lateral wings and a short dorsal ridge or crest, sometimes also with short appendages between the lateral wings and the dorsal crest, the lateral wings usually rounded or flabellate; cotyledons unequal, the outer 1 larger and enveloping the inner 1.

Hiraea is a genus of approximately 40 species in the American tropics occurring especially in wet forests but also in dry areas. Most species are found at lower elevations but some range as high as 2,000 m.

a. Inflorescences simple, an axillary peduncle supporting a multiradiate umbella; indument on branchlets, main nerves of leaves; petioles, peduncles, and pedicels of appressed trichomes (sericeous or strigose); leaf blades medium size; wings of samaras rather large ---------- 5. *H. quapara*

aa. Inflorescences branched or occasionally simple; umbels containing 4 flowers.

b. Indument on branchlets, inflorescences, and petioles densely and thickly tomentose, with straight rigid acute patulous branched trichomes; blades mostly more than 25 cm long, hirsute villous.

c. Lateral wings of samaras membranaceous, obovate or subreniform, 12–18 mm long, 7–10 mm high ---------- 3b. *H. grandifolia* var. *parvifructa*

cc. Lateral wings of samaras thin-membranaceous, hyaline, depressed-ovate or suborbicular, 4.5–5.5 cm long, 2.5–3.2 cm high ---------- 3a. *H. grandifolia* var. *grandifolia*

bb. Indument on branchlets, inflorescences and petioles strigose, sericeous, pubescent, puberulous or glabrate; blades usually less than 20 cm long.

d. Lower leaf surfaces appressed-sericeous throughout; wings of the samaras membraneous or rigid subcoriaceous; stipules close to the apex of the petiole.

e. Lateral wings of the samaras subcoriaceous, cuneate-flabellate, small, 12–15 × 9–12 mm; pedicels stout, thickening to the apex; leaf blades brownish sericeous abaxially ---------- 2. *H. faginea*

ee. Lateral wings of the samaras thin-membranaceous, subobovate, twice as

large as the above, 25–30 × 20–25 mm; pedicels slender, not thickening toward the apex; leaf blades shining silvery sericeous abaxially ..... 4. *H. papilionacea*

dd. Lower leaf surfaces with only the costa and main veins more or less densely appressed-sericeous, most of the surface puberulous or glabrous; wings of the samaras membranaceous; stipules borne near apex or near the middle of the petiole.

f. Petiole with 2 subulate stipules close to the apex; leaf blades obovate, oblong or sublanceolate-elliptic, usually acuminate or apiculate at the apex, obtuse at the base; petals thick, carnose, orbicular at base, cordate, 4–6 mm long, the margin denticulate, the internal fimbriate-glandular; styles sericeous at base; lateral wings of samara suborbicular or reniform, 22–40 × 15–20 mm ..... 1. *H. fagifolia*

ff. Petiole with 2 subulate stipules at the middle or below; leaf blades obovate or obovate-oblong, somewhat contracted above the base, the apex obtuse, rarely attenuate, the base obtuse, emarginate or cordate; petals membranaceous, 5–8 mm long, orbicular, denticulate or more or less fimbriate, the internal petal fimbriate, glandular; styles glabrous; lateral wings of samara 15–20 × 10–15 mm ..... 5. *H. reclinata*

1. **Hiraea fagifolia** (DC.) Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 258. 1840.

Banisteria? fagifolia DC., Prodr. 1: 590. 1824. TYPE: French Guiana, Cayena (G-DC, not seen).

Liana; the stems densely appressed-pubescent when young with weak or stout, appressed, T-shaped trichomes, glabrate in age. *Leaves* opposite, oblong-elliptic to lanceolate-elliptic, ovate-lanceolate or oblanceolate, acuminate at the apex, obtuse to narrowly rounded at base, 9–20 cm long, 3.5–9.0 cm wide, sparsely appressed-pubescent above, especially along the major veins, soon almost glabrous, the midrib sunken, sericeous on the midrib below, with a few scattered trichomes over the blade surface; primary lateral veins 9–12 on each side, more or less evenly spaced, somewhat closer at the base, the tertiary veins prominulous, extending almost straight and parallel between the primary lateral veins, the margins entire, rarely glandular; petioles 4–10 mm long, appressed-pubescent with a pair of plate-shaped, elevated glands at the apex; stipules subulate, 3–5 mm long, borne adaxially near the apex of petiole. *Inflorescence* of short triumbelliferous cymes, shortly pedunculate (0–5 mm); peduncles of the umbels 2–6 mm long, puberulent; bracts and bracteoles ovate, appressed-pubescent, 1.0–1.5 mm long; pedicels slender, 1.0–1.5 cm long, sericeous to sparsely appressed-pubescent. *Flowers* 12–14 mm in diameter; sepals deltoid, narrowly rounded at the apex, sericeous, ca. 2 mm long; calycine glands present or *absent*? (see *Tonduz 13166*), ellipsoid; petals yellow, glabrous, thickly membranaceous, orbicular-obovate, cuneate at base, ca. 5 mm in diam., denticulate marginally, the 4 lateral petals fimbriate-glandular, the anterior petal more or less entire, the claws ca. 2 mm long; stamens glabrous; styles 3.5 mm long, thickened, somewhat curved, the apex truncate, dilated with the dorsal angle apiculate, the ovary hirsute-villose. *Schizocarp* of 3 samaras, the lateral wings thinly membranous, semiorbicular, puberulent to weakly villous, 15–18 mm long, 2.2–3.0 cm wide, the dorsal crest 1.5–2.0 mm high, pubescent.

The species ranges from Mexico (?) and Belize to Colombia, Venezuela, the Guianas, Brazil and Peru. In Panama it is known only from tropical moist forest

in Bocas del Toro and Chiriquí Provinces. The only Panamanian collection had flowers in late February.

BOCAS DEL TORO: Bocas del Toro, along stream below dam, *Durkee 71-149* (MO). CHIRIQUÍ: Fortuna dam site, 1400–1600 m, *Folsom et al. 5605* (MICH, MO, PMA, US).

2. **Hiraea faginea** (Swartz) Niedenzu, Verz. Vorless. Lyc. Hos. W. 1906/7: 16. 1906.

Malpighia faginea Swartz, Prodr. 74. 1788. TYPE: West Indies, Grenada, *Masson* (BM).
Hiraea chrysophylla Griseb., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1852: 48. 1852. TYPE: not seen.
H. manzanillensis Beurl., Act. Holm. 117. 1854. TYPE: Panama, *Billberg 286* (S).
H. faginea fo. *glandulifera* Niedenzu, Verz. Vorless. Lyc. Hos. W. 1906/7: 16. 1906.

Lianas, younger stems, axes of inflorescence, sepals, and lower leaf surfaces densely appressed-pubescent with T-shaped trichomes, those of the stem very short, those of the lower leaf surface light brown. *Leaves* opposite, oblong-elliptic, acuminate, narrowly rounded to subcordate at the base, 9–16 cm long, 3.5–6.0 cm wide, glabrous above, the trichomes of the lower surface contiguous; petioles 4–6 mm long; paired subulate stipules to ca. 4 mm long borne near the petiole apex on the upper surface. *Inflorescences* small, cymose, axillary umbels; peduncles usually 3-branched, each supporting an umbel and mostly shorter than the pedicels; pedicels to 1.5 cm long, stout, thickening distally. *Flowers* to 2 cm in diam., with the sepals ovate, eglandular or all but one usually with conspicuous glands, the glands oval or oblong-oval, 1.5–2.5 mm long; petals clawed, yellow, orbicular, 6–8 mm wide, the claw to 3.3 mm long, the margins lacerate, the petal opposite the eglandular sepal held somewhat erect, smaller than the other petals, to ca. 4.5 mm wide, the margin with glandular teeth; stamens 10, subequal, glabrous; styles 3, pubescent at the base, 1 erect, the 2 opposite the erect petal arched-spreading. *Schizocarp* of 3 samaras, sometimes 1 or 2 by abortion, each samara with 2 large lateral wings; seminiferous area globular, ca. 5 mm long, densely appressed pubescent; lateral wings rigid-subcoriaceous, flabellate, cristate, 12–15 mm long, 10–12 mm broad; dorsal wing coriaceous, 1.0–1.5 mm high, moderately appressed pubescent especially near the body, glabrate toward the outer margin, the margin entire.

The Panamanian material seen consists of both the forma *faginea* and the variety *glandulifera* Niedenzu. The latter variety differs from the typical variety only in having calycine glands, and since they do not appear to be separated geographically or ecologically in Panama the forma *glandulifera* Niedenzu is not recognized here. In Panama, collections bearing calycine glands are slightly more prevalent than those not bearing calycine glands.

The species is distinguished by its small oblong-elliptic leaves with pale, densely strigose lower surfaces, the trichomes contiguous or essentially so, and by the smaller, coriaceous samaras. The species is close and perhaps inseparable from *H. chrysophylla* Juss. from South America which differs in having a golden yellow lower blade surface, and having the lateral wings divided and more densely pubescent.

Hiraea faginea ranges from Nicaragua to Panama and the West Indies. In

Panama, the species is known from wetter parts of tropical moist forest, especially on the Atlantic slope, premontane wet forest and tropical wet forest at elevations from sea level to ca. 500 m. In Panama, flowering takes place from April to October, but occurs mostly in June and July at the beginning of the rainy season. Flowers are rarely seen at the beginning of the dry season in January. Fruits apparently mature from July to November, but perhaps also in the early dry season.

BOCAS DEL TORO: Bocas, *Carlton 151* (GH, US). CANAL ZONE: Juan Mina, Rio Aguardiente Chico, *Bartlett & Lasser 16545* (MO). Between Gatún Locks and Fort Sherman, *Croat 15357* (GH, MO, NY). Pipeline Road, 5–7 mi N of Gamboa, *Gentry 2048* (GH, MO, NY). Banks of Chagres River near Gatún, *Maxon 4885* (US). Río Indio de Gatún, *Pittier 2771* (F, US). Trinidad River, Agua Clara, *Pittier 4000* (A, F, MO, US). Near Fort Sherman, *Standley 30932, 31177* (US). Gamboa, *Tyson et al. 4591* (MO). Mouth of Río Cocoli, Miraflores, *White 136* (F, GH, MO). Miraflores Lake, *White, G. 157* (GH, MO, US). BARRO COLORADO ISLAND: *Brown 35, 58* (both F); *Foster 1105* (DUKE, MO, PMA); *Kenoyer 403, 462, 463, 517* (all F, US); *Montgomery 61* (MO). COLÓN: Portobelo, *Billberg 286* (S). Between Palma Bellas and Salud, near sea level, *Croat 36862* (DUKE, MICH, MO, US). Ocean trail between Río Indio and Miguel de la Borda, sea level, *Croat 36918* (MO). DARIÉN: Trail to Cerro Pirre, *Duke & Bristan 251* (DUKE, MO, OS). San Jose River, *Duke & Bristan 400* (MO). 1–5 mi downstream from El Real, *Duke 4928* (MO, PMA, US). Río Balsa between Manene and Tusijuanda, *Duke 13578* (MO, OS). Río Turia below El Real and Piraque Island, *Stern et al. 898* (CS, GH, MO, NY). PANAMÁ: N of El Llano, 500–800 m, *Gentry 5583* (GH, MO, NY). Río Mamoni below La Capitana, 20–25 m, *Pittier 4584* (F, NY, US). SAN BLAS: Canal just N of Mandinga airport, *Duke 14837, 14847* (MO, OS). Mainland opposite Aligandí, *Lewis et al. 178* (MO, US).

3. **Hiraea grandifolia** Standley & L. O. Williams, Ceiba 3: 116. 1952. TYPE: Costa Rica: Puntarenas Province, Palmar Sur de Osa, *Allen 5855* (EAP, holotype; F, US, isotypes).

3a. **Hiraea grandifolia** Standley & L. O. Williams var. **grandifolia.**

Liana, the young stems densely ferruginous tomentose, the internodes to 5 cm long. *Leaves* opposite, obovate, rounded and cuspidate to short acuminate at the apex, rounded to subcordate at the base, 12–28 cm long, 6–17 cm wide, glabrous or nearly so on the upper surface except on the veins, densely hirsute-villous below; petioles 1.5–3 cm long; stipules subulate, borne near the apex of the petiole. *Inflorescence* axillary, umbelliform-fasciculate; peduncle usually to 6 cm long, 1–few-flowered; pedicels ca. 2 cm long, densely hirtellous, bracteate at the base. *Flowers* yellow; sepals densely hispid, blunt, to 3 mm long, 4 of them bearing 2 whitish disciform glands ca. 1.5 mm long; sexual parts of flower not studied. *Infructescence* with peduncles short or to 10 mm long, 1–several-flowered; pedicels 20–23 mm long, the peduncles and pedicels densely tomentose, the lateral wings depressed-ovate to suborbicular, hyaline, membranaceous, drying pale brown, radially veined, sparsely patulous, pubescent with T-shaped trichomes, the margin straight to minutely sinuate, 4.5–5.5 cm long, 2.5–3.2 cm high, the veins prominulous, anastomosing toward the margin of the wing, the dorsal wing much reduced, triangular, to 4.5 mm high, the seminiferous area densely hispid with stiff, straight, pointed trichomes.

Hiraea grandifolia var. *grandifolia* is apparently restricted to southwestern Panama and Costa Rica in the vicinity of Golfo Dulce in areas of tropical wet forest or premontane wet forest. In Panama it is known from a single collection.

CHIRIQUÍ: Burica Peninsula, *Liesner 360A* (MO).

3b. **Hiraea grandifolia** Standley & L. O. Williams var. **parvifructa** Cuatr. & Croat.[10] TYPE: Panama, *Nee 7789* (MO, holotype; US, isotype).

Large canopy *lianas*; trunk 10 cm or more broad; dark brown, densely lenticellate, all but the older stems densely ferruginous tomentose. *Leaves* opposite, obovate, rounded and cuspidate to short-acuminate at the apex, tapered to a narrow, cuneate, rounded or subcordate base, 12–45(–67) cm long, 6–22(–28) cm wide, glabrous above except on the veins, densely hirsute-villous beneath with branched trichomes, with 9–14 pairs of major lateral veins, impressed above, raised below; petioles densely tomentose, 0.5–2.0 cm long, bearing a pair of prominent subulate stipules at about the middle on the upper side. *Inflorescence* axillary, of stalked umbels; peduncles short or to 8 mm long, 2–4 per axil; peduncles, pedicels and calyx densely tomentose; pedicels 1–2 cm long, with thick T-shaped trichomes. *Flowers* 5-parted; sepals blunt, to 3 mm long, eglandular or 4 of them bearing 2 red-orange, shiny, ovate glands to 1.5 mm long; petals yellow, clawed, fimbriate, the petal opposite the eglandular sepal held somewhat erect and marked with orange, its fimbriate margins gland-tipped; stamens 10, of 2 lengths, shorter than the styles and curling after the anthers have fallen; styles 3, interspersed with dense straight trichomes, 2 twisted to either side of the erect petal, the stigma subterminal. *Fruit* a schizocarp of 3 samaras, the lateral wing subreniform or broadly obovate-elliptic, firmly membranaceous, radially veined, erose at the margin, 12–18 mm long, 7–10 mm wide, the dorsal wing much reduced, triangular, thickened to the base, 1.5–2.0 mm high, to 2.5 mm long, the seminiferous area dorsally tuberculate and densely hispid with stiff straight, pointed trichomes; between lateral and dorsal wings, usually 1 or 2 thin, linear appendices ca. 2–3 mm long.

Hiraea grandifolia var. *parvifructa* flowers from November to February and fruits mature from February to April. It is known from tropical moist forest below 300 m elevation. Its closest relative is *Hiraea grandifolia* Standley & L. O. Williams var. *grandifolia* from southeastern Costa Rica and southwestern Panama.

Both varieties of *H. grandifolia* are characterized by being densely tomentose, but var. *parvifructa* is distinguished by its smaller fruits, thinner pedicels, with stiffer trichomes, and longer peduncles.

The taxon was treated by Croat (1978) as *H. grandifolia*, and a footnote mentioned that it was to have been treated in this treatment as *H. croatii*. It has since been concluded that the taxon is not recognizable at the specific level and the name *H. parvifructa* better describes the variety.

CANAL ZONE: Between locks and Fort Sherman, *Croat 15370* (MO). Ancón, *Mason 12* (US). BARRO COLORADO ISLAND: *Aviles 19* (F, MO); *Croat 6503, 7739, 8059, 11292* (all MO), *12697* (F, MO, NY, PMA, SCZ), *13808* (F, MO, NY, SCZ); *Foster 1371* (MO, PMA); *Kenoyer 680* (US); *Luteyn*

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[10] *Hiraea grandifolia* var. *parvifructa* Cuatr. & Croat, var. nov. Differt var. typica fructu minore, pedicellis gracilioribus, trichomatibus rigidioribus, pedunculis longioribus.

& Croat 911 (F); *Montgomery 139* (MO); *Shattuck 7* (MO). COCLÉ: El Valle, end of road to Hotel Turistico, *Folsom 3127* (MO). COLÓN: Disturbed remnants of tropical moist forest along tributary of Quebrada Ancha, 4 km E of Buena Vista, 3 km N of cement plant, 80 m, *Nee 7789* (MO, US). PANAMÁ: Capira, *Bro. Paul 132* (US).

4. **Hiraea papilionacea** Cuatr. & Croat.[11] TYPE: Panama, *Croat 17075* (MO-2083950, holotype).

Lianas or arching *shrubs* to 2.5 m tall; stem sericeous, with weak interpetiolar ridges and also with slender ribs extending downward from the petioles, the trichomes brown, T-shaped. *Leaves* opposite, oblong-elliptic, gradually acuminate (the acumen acute to rounded at the apex and apiculate with the margins rolled inward), acute to obtuse at the base, 9–12 cm long, 3.0–4.5 cm wide, above glabrous, drying dark brown, beneath densely tan-brown sericeous, the trichomes T-shaped, short, completely contiguous; primary lateral veins 10–12 pairs, arcuate-ascending to the margins; the secondary veins moderately obscure; petioles 7–10 mm long, conspicuously canaliculate, sericeous to tomentose, with a pair of plate shaped glands borne adaxially near the apex; stipules subulate, borne near the apex on the upper surface. *Inflorescence* of axillary umbels; peduncles 6–8 mm long, sericeous; bracts narrowly triangular-ovate, ca. 2 mm long, densely pubescent; bracteoles ovate, ca. 1 mm long, pubescent; pedicels slender, 10–12 mm long, sericeous to weakly patulous-pubescent, the T-shaped trichomes short and stout. *Flowers* with the calyx lacking obvious glands, the sepals ca. 2 mm long, obtuse at the apex, densely appressed-pubescent outside and glabrous within, folding along the middle when drying; petals not seen. *Schizocarp* of 3 samaras, each samara with 2 large lateral wings, these orbicular-auriculate, membranaceous, 2.5–3.0 cm long, 2.0–2.5 cm wide, drying orange-brown, thinly appressed, silvery-pubescent, the veins prominulous, the outer margin smoothly irregular, the dorsal wing absent or scarcely more than 1 mm high, the seminiferous area 3–4 mm long, densely pubescent.

Hiraea papilionacea is known only from a cultivated collection at Summit Gardens, and the original source is unknown. It was in fruit in late August when collected. It is most similar to *Hiraea faginea* but can be distinguished by the shape and larger size of the thin samara wings.

CANAL ZONE: Summit Gardens in hedge at sales house, *Croat 17057* (MO).

5. **Hiraea quapara** (Aubl.) Sprague, J. Bot. 62: 22. 1924.—FIG. 7.

Banisteria quapara Aubl., Hist. Pl. Guiane 1: 464, *tab. 186*. 1775. TYPE: French Guiana, "ad margines pratorum camporum Guianae," *Aublet* (BM).

Hiraea multiradiata Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 257. 1840. TYPE: *Aublet*, the same collection as the type of *Banisteria quapara* Aubl. Nom. illeg. incl. typ. sp. prior.

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[11] *Hiraea papilionacea* Cuatr. & Croat, spec. nov. *Frutex* scandens, foliis oppositis coriaceis oblongo-ellipticis, acuminatis, 9–12 × 3.0–4.5 cm, supra glabra, subtus dense adpresseque fulvescente sericeis; petiolis 7–10 mm, glandulis stipulis duobus adaxiale circa apicem. Pedicelli teneri 10–12 mm longi, subsericei. Samarae alis lateralibus basi paulo coalitis tenuiter membranaceis rotundato-auriculatis, 2.5–3.0 × 2.0–2.5 cm, adpresse sericeis, crista dorsali brevissima, integra.

FIGURE 7. *Hiraea quapara* (Aubl.) Sprague—A. Branch with juvenile fruits (×½).—B. Mature fruits (×½). [After *Croat 11931* (MO).]

H. smilacina Standley, Contr. Arnold Arbor. 5: 87. *Pl. 13.* 1933. TYPE: Panama, *Bailey & Bailey 403* (F, holotype; US, photo).

Lianas, most parts except upper leaf surface densely pubescent with T-shaped trichomes, those of the stems, petioles, peduncles, pedicels and calyces appearing appressed-pubescent; periderm of older stems thin, reddish-brown, becoming fissured. *Leaves* opposite, sublanceolate-elliptic to elliptic, acute or gradually long-acuminate, ovate to subcordate at the base, mostly 8–25 cm long, 4–11 cm wide, glabrous above except the midrib, softly pubescent throughout below with stalked T-shaped trichomes, the midrib and major veins appressed-pubescent; petioles 1–2 cm long with 2 sessile glands at the apex; 2 subulate stipules to 2 mm long borne at about the middle of the petiole. *Inflorescence* of solitary, axillary umbels; small bracteoles borne at the apex of peduncles; peduncle 2.5–4.0 cm long, thick,

rigid, pubescent with (6–)35–60 flowers; bracts 2, subulate, 2.5 mm long; bracteoles ovate-oblong, 2 mm long; pedicels 13–20 mm long. *Flowers* 10–12 mm diam.; sepals triangular-ovate, 4 of them sometimes with 2 large glands; petals clawed, the blade ovate-suborbicular, yellow except orange-red at the base, subcordate at the base, 4–5 mm diam., the margin sinuate, all but the inner small one also fimbriate, the inner one orange-red; stamens 10, subequal; styles 3, 1 erect, 2 curved, the apices narrowly spatulate-truncate with the outer angle acute or shortly apiculate, the ovary hirsute. *Fruit* a schizocarp of 3 samaras, softly hirsute especially on the body; wings lateral, reniform, 0.5–2.0 cm long, 2.0–3.8 cm wide, thin, the outer margin sinuate-undulate.

This species flowers in Panama from March through August, especially in June and July during the early rainy season. Fruits mature from July to November.

Hiraea quapara ranges from Mexico (Vera Cruz) to the Guianas. In Panama it is known from wetter parts of tropical moist forest and premontane wet forest, usually at lower elevations, but sometimes to elevations of 1,000 m. The species is recognized by its prominently pedunculate umbels. It is perhaps most closely related to *H. velutina* Ndzu. from Mexico and Middle America.

CANAL ZONE: BARRO COLORADO ISLAND: *Bailey 403* (F); *Croat 6842, 12690* (both MO, SCZ), *Croat 11931* (F, MO, NY, SCZ); *Dressler 4865* (MO); *Foster 1061, 1125, 2365* (all DUKE, GH, MO, PMA, SCZ); *Shattuck 1020, 1136* (both F, MO, US); *Woodworth & Vestal 661* (A, F, MO). COLÓN: Achiote, *Tyson et al. 4518* (MICH, MO, SCZ, US). DARIÉN: Rio Balsa, between Maume and Tusijuanda, *Duke 13553* (MO, OHIO). PANAMÁ: El Llano-Carti Road, 8 km N of El Llano, *Dressler 4297* (MO). Cerro Campana above Su Lin Motel, 3000 ft, *Dwyer & Kirkbride 7830* (MO, US). Cerro Campana, N slope, 850 m, *Mori & Kallunki 1932* (MO). El Llano-Carti Road, 8–11 km from Interamerican Highway, 300–400 m, *Mori 7754* (MICH, MO, PMA, US).

5. **Hiraea reclinata** Jacq., Enum. Pl. Carib. 21. 1760 (nomen); Sel. Stirp. Amer. 137. *tab. 174, fig. 42.* 1763. TYPE: Colombia, Cartagena, *Jacquin* (not seen).

Triopteris reclinata (Jacq.) Cav., Diss. 9: 431. 1790.
Malpighia obovata H.B.K., Nov. Gen. Sp. Pl. 5: 146. 1822. TYPE: Colombia, Nare, Río Magdalena, *Humboldt & Bonpland* (P, not seen; F, photo FM-37494).
Hiraea hookeriana Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot., Sér. 2. 13:) 258. 1840. TYPE: Trinidad, Herb. Hook., not seen.
H. kunthiana Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot., Sér. 2. 13:) 258. 1840. TYPE: Colombia, Nare, Río Magdalena, *Humboldt & Bonpland* (P, not seen; F, photo FM 37494).
H. barclayana Benth., Bot. Voy. Sulphur 3: 75. 1844. TYPE: *Barclay 1127* (BM, MO).
Tetrapteris panamensis Seemann, Bot. Voy. Herald 42. 1852–57. TYPE: Santiago de Veraguas, *Seemann* (BM; MO, photo by Nowicke 1215).
Hiraea panamensis (Seem.) Griseb., Fl. Bras. 12(1): 100. 1858.
H. obovata (H.B.K.) Niedenzu, Verz. Vorless. Lyc. Hos. W. 1906–7: 7. 1906.
H. transiens Niedenzu, Verz. Vorless. Lyc. Hos. W. 1906: 8. 1906. TYPE: Colombia, Choco, Istmó de San Pablo, *Triana 5579-2* (COL, isotype).

Lianas, wide ranging in forest over low vegetation or pendant from larger trees; younger parts, including peduncles, pedicels, and calyces densely pubescent with T-shaped trichomes. *Leaves* opposite, obovate-oblong, elliptic or obovate, acute or rounded at the apex, sometimes acuminate especially when young, tapered to an obtuse or subcordate base, 5–15(–22) cm long, 2.5–8.5 cm wide, glabrate to sparsely pubescent on surface below, the veins below densely appressed-pubescent; petioles usually ca. 5 mm long, with paired sessile glands near

the apex; stipules subulate, borne about midway up the petiole, slender, 3–5 mm long. *Inflorescences* cymose panicles, axillary, small; flowers in small umbels 1.8–2.2 cm wide; peduncles nearly obsolete or 1–5 mm long, appressed-pubescent; bracts and bracteoles ovate, acute, pubescent, to 1.5 mm long; pedicels 9–25 mm long. *Flowers* with the sepals triangular to ovate, all but one usually bearing prominent, stalked glands, these greenish-yellow, round to ellipsoid, ca. 1.5 mm long; petals yellow, often marked with orange near the base, membranaceous, glabrous, 4.5–7.0 mm long, clawed, the blade orbicular, the petal opposite the glandless sepal with a fimbriate margin; stamens 10, glabrous, of irregular sizes, some directed inward beneath the styles; styles 3, flattened, curved, to 4.5 mm long, the apex subtruncate-spatulate with the inner angle protruding and stigmatic, the dorsal angle apiculate; lobes of the ovary densely pubescent. *Fruit* a schizocarp of 3 samaras, the wings lateral, orbicular to reniform, 1.2–1.6 cm long, 2–3 cm wide, membranaceous, with sparse appressed T-shaped trichomes and prominent reticulate veins, the margin sinuate; seminiferous area subcuneate, sparsely setaceous, the dorsal crest 2 mm high.

Hiraea reclinata ranges from Mexico to Panama, Colombia, Venezuela, and Brazil. In Panama the species occurs in moister parts of tropical moist forest.

In Panama, the species flowers from January to May, with fruits mature from February to June.

CANAL ZONE: Near Fort Randolph, *Maxon & Harvey 6529* (GH, US). Rocky slopes along Río Chagres, Alejuela, *Pittier 3519* (F, US). BARRO COLORADO ISLAND: *Aviles 2222* (F, MO); *Croat 5026* (DUKE, MO), *5592* (MO, NY, SCZ), *5614* (F, MO, SCZ), *5719, 5728, 5927* (all MO), *7210, 7747* (both F, MO, NY, SCZ), *9225, 9422* (both MO, SCZ), *14028* (MO); *D'Arcy 3934* (MO, PMA); *Foster 803, 1385* (PMA), *1771, 2152, 2296* (all GH, MO, PMA, SCZ, US); *Hladik 359* (MO); *Shattuck 1162* (F, MO); *Standley 31446* (US). CHIRIQUÍ: Burica Peninsula, Quebrada Punta de Piedra, 2 mi SW of Puerto Armuelles, 0–100 m, *Liesner 338A* (MO). Burica Peninsula, Quebrada Milliza, 6 mi S of Puerto Armuelles, 0–150 m, *Liesner 494B* (MO). COLÓN: 3 mi SW of Colón along beach, *Croat 14163* (MO). Guaira mainland opposite Isla Grande, *D'Arcy 4049, 4050* (both MO). DARIÉN: Camp Summit between Morti and Sasardi, 1800 ft, *Duke 10673* (MO). Along Sambu River, above tide limit, *Pittier 5563, 5566* (US). Forests around Pinogana, *Pittier 6529, 5631* (GH, NY, US). PANAMÁ: Along Río Maje, ca. 4–5 mi above waterfall near new Bayano lake, 1000 m, *Croat 34674* (CAS, MICH, MO, PMA). San José Island, *Erlanson 70* (GH, NY, US); *Johnston 732* (GH).

7. JUBELINA

Jubelina Juss., Icon. Sel. 3: 19. *tab. 32.* 1837. TYPE: *Jubelina riparia* Juss.

Diplopterys Juss. sect. *Eujubelina* Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 4: 17. 1912. TYPE: *Diplopterys riparia* (Juss.) Niedenzu = *Jubelina riparia* Juss.

Lianas; stems twining. *Leaves* opposite, mostly subcoriaceous; stipules small, interpetiolar. *Inflorescences* cymose-paniculate; peduncles bracteolate; pedicels well developed. *Flowers* with 5 sepals, the 4 lateral sepals each bearing a large gland at the base; petals clawed, the limb elliptic to obovate, the margins glandular, the posterior petal smaller; stamens 10, fertile, slightly unequal, the filaments flattened, glabrous, united at the base, the anthers subequal, longitudinally dehiscent, glabrous, the connective narrow; ovary globular, 3-carpellate, 3-locular, conspicuously sulcate, the styles 3, thick, truncate at the apex, the dorsal angle obtusely apiculate. *Fruit* a schizocarp of 3 samaras on a pyramidal torus, each samara with a rather short dorsal wing and at each side with 2 much longer

lateral wings, the seminiferous area inflated, tuberculate between the lateral wings, trilocular, the median cavity monospermous, the lateral loculi empty; seed subovoid or pyriform, the cotyledons straight.

Jubelina is a genus of 5 species mainly from South America. Only *J. wilburi* occurs in Central America. The genus was maintained as *Diplopterys* section *Eujubelina* by Niedenzu. It was restored as an independent genus by Cuatrecasas (1958), Hutchinson (1967), and Anderson (1976).

1. **Jubelina wilburi** W. R. Anderson, Brittonia 28: 410. 1976. TYPE: Panama, *Luteyn & Wilbur 4574* (DUKE, holotype).—FIG. 8.

Lianas, all parts drying dark; stems sericeous or becoming glabrate, the trichomes golden brown, T-shaped, sessile, ca. 0.2 mm long, straight and appressed. *Leaves* opposite, sericeous, eglandular, elliptic ovate or rounded, acuminate at the apex, obtuse or rounded at the base, 11.0–17.5 cm long, 6.5–11.5 cm wide, sometimes with a few large sunken glands in the lower ⅓ of the blade, sparsely and inconspicuously appressed-pubescent, soon glabrate, the midrib densely pubescent above, prominently sunken, primary lateral veins 5 or 6 on each side, arcuate-ascending; petioles 1.0–1.7 cm long; stipules triangular, 0.5 mm long. *Inflorescences* terminal and upper axillary, cymose-paniculate, the branches usually to 7 per node, densely rufous tomentose, the trichomes appressed to patulous, the distal nodes with leaflike bracts 6–17 mm long, these sericeous, prominently 2–4-glandular; flowers in 4-flowered umbels or 6-flowered corymbs; floral bracts 2–4(–6) mm long, ovate or elliptic, eglandular; peduncles 1.0–3.5 mm long; pedicels 2–4 mm long. *Flowers* with sepals 5, 2.5–3.0 mm long, narrowly ovate, obtuse and revolute at the apex, tomentose outside, glabrous within, the anterior sepal eglandular, the 4 lateral sepals each with 1 large gland, these 1.5 mm long; petals 5, clawed, greenish-yellow, sericeous, glabrous towards the margin, the 4 lateral petals with the limb 3.0–4.5 mm long, 2.5–4.0 mm wide, rounded to broadly obovate, concave, rounded to weakly hastate at the base, the margin erose and usually eglandular, posterior petal erect, the limb 2.5–2.8 mm long, 1.5–2.5 mm wide, elliptic or obovate, the margin glandular; stamens 10, the filaments glabrous, connate at the base, to ca. 1 mm high, 1.8–2.5 mm long, slightly unequal, the anthers subequal, to 1 mm long, glabrous; ovary globular, 1.5 mm high, tomentose, each of the 3 carpels several-sulcate, the styles 3, 2 mm long, equalling or slightly exceeding the anthers, glabrous or pubescent, subequal, the anterior style inclined toward the posterior petal, the 2 posterior styles arcuate-ascending. *Fruits* of 3 samaras or 1 or 2 by abortion, 2.0–2.5 cm long, 5–6 cm wide, sparsely appressed-pubescent throughout; samaras with the lateral wings broadly ovate, confluent at the base, 2.5–4.0 cm long, 2.5–3.5 cm wide, rounded at the apex, the veins conspicuous, the dorsal wing 2.0–2.7 cm wide, 1.0–1.3 cm high, semicircular; seed pyriform, ca. 1 cm long.

This species is found in Panama and Costa Rica, occurring in premontane wet and tropical wet forests at elevations of 400–1,000 meters.

The species is closest to *Jubelina uleana* (Niedenzu) Cuatr. from Peru, with which it shares yellow flower color, other species being pinkish with almost glabrous leaves. *Jubelina wilburi* differs from *J. uleana* in having smaller flower

bracts, usually 2–4 mm long vs. 7–11 mm long, which are yellow- or brown-tomentellous rather than silver-velutinous as in *J. uleana*. In addition the sepals are glabrous within versus velutinous near the tip in *J. uleana*, and the fruits lack a well-developed intermediate wing between the dorsal and lateral wing. In *J. uleana* the intermediate wing is subequal to the central dorsal wing.

COLÓN: E Ridge, Santa Rita, *Duke 15300* (MO). Santa Rita Ridge, *Dwyer 9544* (MICH, MO, PMA, RSA). Santa Rita Ridge, ca. 4–5.5 mi E of Transisthmian Highway, *Lewis et al. 1281, 5281* (both MICH, MO, PMA, US). VERAGUAS: Road beyond Escuela Agrícola, Alto Piedra above Santa Fé, 800–1000 m, *Luteyn & Wilbur 4574* (DUKE).

8. MALPIGHIA

by José Vivaldi[12]

Malpighia L., Sp. Pl. 425. 1753. Gen. Pl. ed. 5. 194. 1754. TYPE: *M. glabra* L.

Erect, spreading *shrubs* or small *trees* 1–6(–10) m tall, soboliferous and propagating by underground stems or root suckers, or with one main trunk branching at some distance from the base, rarely prostrate or a woody *vine*; bark rough, longitudinally striated and fissured; young branches, petioles and leaves green, young branches sometimes reddish to violet, glabrous or strigillose with straight or slightly undulate, soft, transparent or golden-translucent, small, sessile, specialized "malpighiaceous" hairs 0.5–1(–1.5) mm long, the arms equal, free, becoming glabrous with age. *Leaves* opposite, glabrous, internodes mostly at least ½ the length of the blade, membranaceous to subcoriaceous, flat, entire, variously obovate to elliptic to lanceolate, retuse to cuspidate at apex, rounded to cuneate at base, (1–)2–7(–20) cm long, 0.7–6(–10) cm wide, dark shiny green above, pale green beneath, 2 scutelloid glands present below on either side of the midvein on the lower third of the blade; stipules interpetiolar, eglandular, mostly free linear-lanceolate to subulate, green or reddish, glabrous or strigillose, 0.5–3(–4) mm long; petioles slender or robust, eglandular, (1–)1.5–4(–5) mm long. *Inflorescence* axillary, erect, eglandular, glabrous or strigillose, green or reddish, 1–30(–50)-flowered, sessile or pedunculate, or umbel-like or raceme-like contracted panicle 1.5–6 cm long, a common peduncle present or not, to 2(–5) cm long, mostly entire; flowering peduncles always present (looking as part of pedicel) 2–6(–8) mm long, 1-bracteolate at the base, the bract ovate to ovate-lanceolate, acute or rarely obtuse, strigillose, 0.5–2.5(–3.5) mm long, bi-bracteolate at the apex, bracteoles ovate to ovate-oblong, acute or obtuse at apex, strigillose, 0.5–1.5(–2) mm long, pedicels (5–)7–11(–15) mm long. *Flowers* (Fig. 9F) pink, zygomorphic, 1–1.5(–2) cm diam., buds subglobose, pink, 3–5(–6) mm diam., keeled or unkeeled; sepals 5, free, green, ovate to lanceolate-oblong, acute or obtuse at apex, glabrous or strigillose, (2–)2.5–3.5(–4) mm long, calyx 6–10-glandular, anterior sepal sometimes eglandular, antico-lateral sepals 1–2-glandular, postico-lateral sepals 2-glandular, glands oblong, sometimes recurved at the apex, (0.5–)1.5–2.5(–4) mm long, sometimes the anterior 4 smaller than the others; petals 5, free, glabrous, clawed, the posterior petal longer, larger and more robust than the others, (6–)6.5–9.5(–12) mm long, the claw thick, robust, (2–)3–4(–5.5) mm long, limb suborbicular,

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FIGURE 8. *Jubelina wilburi* Anderson—A. Flowering branch (×½).—B. Side view of fruit (×½).—C. End view of fruit (×½). [After *Duke 15300* (MO).]

lacerate-dentate all around, undulated or plaited, (2.5–)3–7(–9) mm diam., the lateral petals smaller than the posterior petal, 5–9 mm long, the claw obviously thinner, (1.5–)2–3 mm long, the limb suborbicular to ovate-deltoid, lacerate-dentate all around or at least on the lower third, revolute or involute, not plicate or undulate, (2–)3–7(–8) mm diam., anterior petals usually smaller than the lateral petals, (4–)4.5–6.5(–8.5) mm long, the claw thin, (1–)1.5–3(–3.5) mm long, the limb ovate-deltoid to suborbicular, entire or sometimes lacerate-dentate at the base, revolute or involute, never plicate or undulate, (1.5–)2–5(–7) mm diam.; filaments 10, glabrous, 2–4 mm long, united at the base to form a short tube (0.5–)1(–1.5) mm long, all filiform and straight except sometimes those opposite the lateral petals, those opposite the sepals 0.5–1.0 mm longer than those opposite the anterior and posterior petals, anthers suborbicular to ovate, 0.5–1.5 mm long, pollination gap (distance between anthers and stigmas) 0–1 mm, the connective

yellow, verrucose, suborbicular to ovate; styles 3, (straight, equal in thickness and length, diverging at acute angles from each other or the lateral styles thicker and longer than the anterior, straight or curved inwards) glabrous, free, (1.5–)2–4.5 mm long, obtuse, truncate or uncinate at apex, never subulate, the stigmatic surface on the inner angle of the apex, the ovary superior, glabrous, 3-locular, syncarpous subglobose, lobed or unlobed, 1.5–2 mm diam., ovules 1 per locule, pendulous, receptacle flat or nearly so; *fruit* 3-seeded, red, glabrous, the fleshy drupe up to 3 cm diam., pyramidato-globose or subglobose and flattened at poles, pyrenes ovoid, united, (oblong and separating at maturity in *M. albiflora*) to 1.8 cm long, winged dorsally and laterally, intermediate wings present or the surface pitted, tuberculate or rarely smooth; seeds with embryo curved, cotyledons folded at apex, endosperm none.

Malpighia is a neotropical genus with about 40 species. Mostly Caribbean, it attains its highest diversity in Jamaica, Cuba, and Hispaniola.

a. Stipules united, 2–3(–4) mm long; inflorescence (4–)10–30(–50)-flowered, raceme-like, the common peduncle robust, (1–)1.5–2.5(–4) cm long, articulated and bibracteolate near the middle; buds keeled ---------- 4. *M. romeroana*

aa. Stipules free, 0.5–1.5(–2) mm long; inflorescence (1–)2–6(–8)-flowered, usually umbel-like, the common peduncle slender, 0–1.2(–2.5) cm long, entire, ebracteolate; buds unkeeled.

b. Leaves appearing somewhat crinkled or puckered upon drying; carpels free from each other for most of their length; pyrenes (1.2–)1.5–1.8 cm long, oblong, smooth with an intermediate wing ---------- 1. *M. albiflora*

bb. Leaves smooth; carpels united; pyrenes 0.7–1.5 cm long, ovoid, tuberculate, without an intermediate wing.

c. Leaves ovate-lanceolate to elliptic-lanceolate to ovate, acuminate or acute at apex, evenly distributed along the twigs; common peduncle (2–)5–12(–25) mm long; calycine glands 6(–10); gynoecium and androecium actinomorphic; fruit smooth; wild trees ---------- 3. *M. glabra*

cc. Leaves variously obovate or oblanceolate, usually obtuse and emarginate at apex, usually crowded in short shoots; common peduncle short or none, 0–5(–13) mm long; calycine glands 7–10, gynoecium and androecium zygomorphic; fruit lobed; cultivated trees ---------- 2. *M. emarginata*

1. **Malpighia albiflora** (Cuatr.) Cuatr., Phytologia 40(1): 36. 1978.—FIG. 9A–E.

Stigmaphyllon albiflorum Cuatr., Ciencia (Méx.) 23(4): 139. *fig. 1: H, I, J.* 1964. TYPE: Colombia: Antioquia; Hoya del Río León o Bacubá, from Villa Arteaga to Chigorodó: Río Porroso: Río Pradera, ca. 90 m alt. *Cuatrecasas & Willard 26181.*

Malpighia oxycocca auct., non Griseb.

M. biflora auct., non Poir.

Erect *shrub* 1–2 m tall or *tree* to 8 m tall, young branches green or sometimes reddish, strigillose. *Leaves* membranaceous to subchartaceous, elliptic to elliptic-lanceolate, acuminate at apex, acute at base, (2.5–)4.5–9(–11) cm long, (2–)2.5–3.5(–4.5) cm wide, upon drying appearing somewhat crinkled or puckered above; petioles slender or somewhat swollen, somewhat strigillose like the young branches or glabrous, 1.5–2.5(–4) mm long; stipules free, reddish, strigillose or glabrous, linear-lanceolate, (1–)1.5(–2) mm long. *Inflorescence* erect, green, rarely reddish, pedunculate, 4–6-flowered umbel-like panicle (1.5–)2–3(–3.5) cm long, the common peduncle minutely strigillose, 3–12(–18) mm long; flowering peduncles usually glabrous, (2–)4–6(–8) mm long, bracts ca. 1.5 mm long; bracteoles ca. 1 mm long, pedicels glabrous, (7–)8–11(–12) mm long, about 2 times as long as the flowering peduncles, small T-shaped bristles at the tip, forming a collar below the

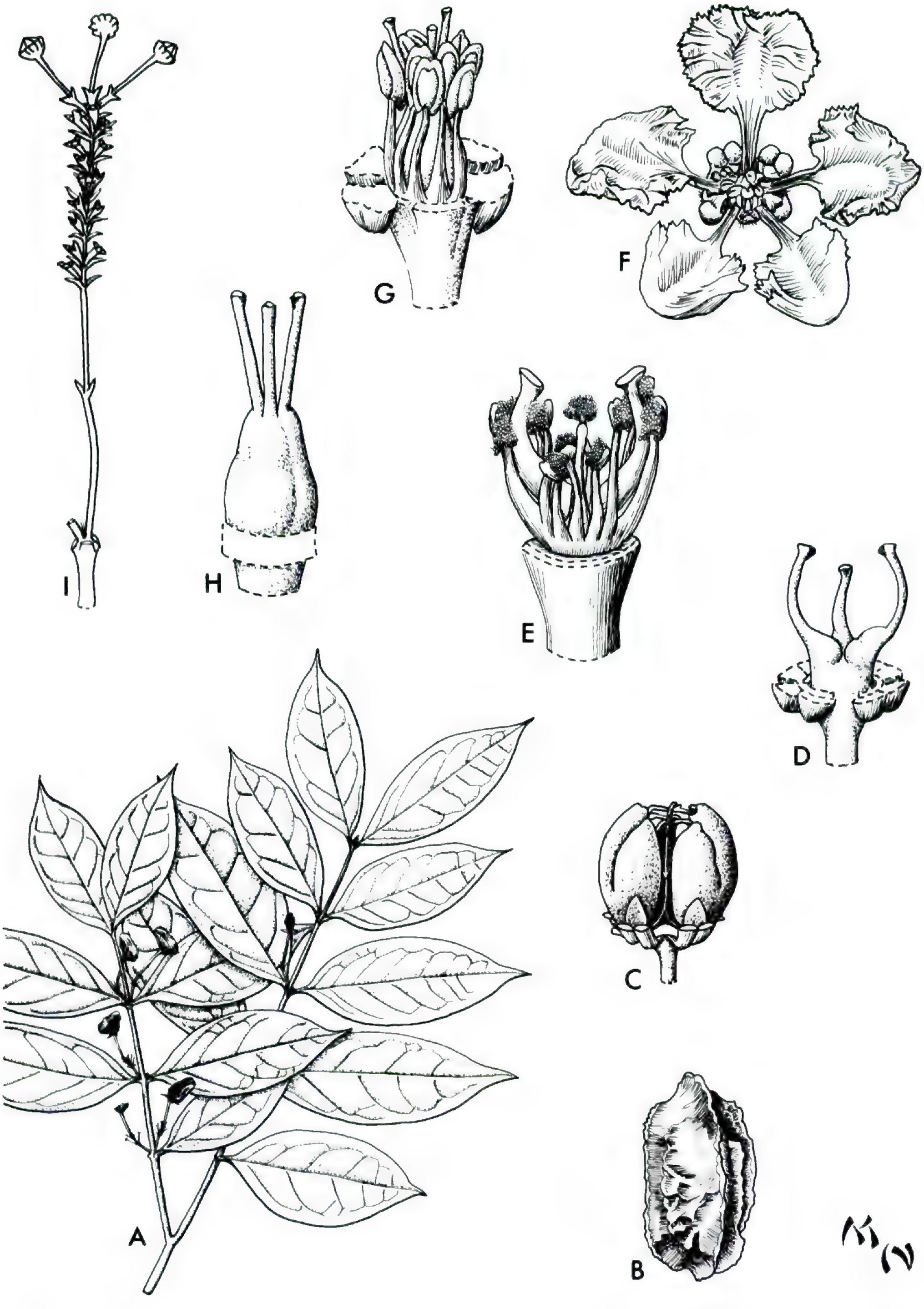

FIGURE 9. *Malpighia*.—A.–D. *albiflora* (Cuatr.) Cuatr.—A. Fruiting branch (×¼).—B. Pyrene (×2).—C. Fruit with three developed carpels (×2).—D. Ovary and zygomorphic styles (×4).—E. *Malpighia albiflora*, *M. romeroana*, and *M. emarginata* (×5), typical style arrangement.—F. Typical *Malpighia* flower (×2).—G.–H. *Malpighia glabra* L.—G. Style and stamen arrangement (×5).—H. Ovary and actinomorphic styles (×6).—I. *Malpighia romeroana* Cuatr. Racemose inflorescence with bibracteolate peduncle (×2½).

sepals. *Flowers* ca. 1.5 cm diam.; buds 3.5–4 mm diam., unkeeled; sepals strigillose, glands 6, 1.5–2.5(–3) mm long, ⅔–¾ as long as the sepals, posterior glands usually larger than the others; posterior petal ca. 9 mm long, lateral petals ca. 8 mm long, anterior petals ca. 6.5 mm long; androecium zygomorphic; filaments ca. 2–3 mm long, lateral filaments obviously longer and thicker than the others, curved inwards over the styles at anthesis, lateral anthers oblong, ca. 1.5 mm long, larger than the others; pollination gap ca. 1 mm long; gynoecium zygomorphic; styles slightly uncinate at apex, lateral styles ca. 2 mm long, obviously longer and thicker than the anterior, curved inwards at anthesis, anterior style straight, thin; ovary obviously 3-lobed, carpels free at upper half. *Fruit* 1.5–2 cm long; carpels usually free from each other for most of their length; pyrenes oblong, (12–)15(–18) mm long, (7–)8–10(–12) mm wide, prominently winged; lateral and dorsal wings entire, sharp, (2–)3–5 mm wide, dorsal wing more prolonged at the apex than the lateral ones and free from them, all wings rounded at apex; intermediate wings present, short, thick tuberculate.

Malpighia albiflora grows in wet forests up to 1,500 m. This species has been collected from Costa Rica to Colombia. In Panama it occurs in premontane wet forest, tropical wet forest and lower montane rain forest.

CHIRIQUÍ: Fortuna, 1000 m, *Folsom & Dressler 5256* (MO). Quebrada Hondo toward summit on Chiriquí Trail, *Kirkbride & Duke 910* (MO). COLÓN: Río Guanche 3–5 mi inland, 10–100 m, *Croat 26235* (CAS, MO, US). Sta. Rita Ridge Road 8.5 mi above highway, *Mori & Kallunki 2098* (MO). DARIÉN: Serrania del Daríen, *Gentry & Mori 13534* (BH, F, MICH, MO, PMA, US). PANAMÁ: Cerro Jefe, *Foster 1823* (PMA). VERAGUAS: Valley of Río Dos Bocas between Escuela Agricola and Calovébora 16.5 km NW of Santa Fé, *Croat 27675* (CR, F, MICH, MO, NY). Base of Cerro Tute, 6.5 km outside Santa Fé, *Folsom 3039* (MO). 8.8 km from Escuela Agricola Alto de Piedra on Santa Fé-Calovébora Road, *Mori & Kallunki 3232* (BH, MO, PMA, US).

2. **Malpighia emarginata** Sesse & Moc. ex DC., Prodr. 1: 578. 1824. TYPE: Flora Mexicana Icones ined. no. 135. (G).

M. berteriana Spreng. in L., Syst. Veg. ed. 16. 2: 383. 1825. TYPE: not known.
M. retusa Benth., Bot. Voy. Sulphur: 74. 1844. TYPE: Ecuador, Guayaquil, Puna Island, *Sinclair*, 1836–39 (K, holotype).
M. lanceolata Griseb., Abh. Königl. Ges. Wiss. Göttingen 7: 185. 1857. TYPE: Guadeloupe, *Duchassaing 5* (GOET, holotype).
M. urens var. *lanceolata* (Griseb.) Grieseb., Fl. Brit. W. In. 117. 1859. TYPE: *M. lanceolata* Griseb.
M. umbellata Rose, Contr. U.S. Natl. Herb. 1: 310. 1895. TYPE: Mexico, Sonora, *Palmer 799* (US-208986, holotype; US-208987, isotype).
M. punicifolia var. *lancifolia* Niedenzu, Gen. Malpighia 8. 1899. TYPE: Guadeloupe, *Duss 2888* (NY, lectotype; MO, US, isotypes).
M. punicifolia var. *vulgaris* Niedenzu, Gen. Malpighia 8. 1899. TYPE: Virgin Islands, St. Thomas, *Eggers 167* (GOET, lectotype; B, G, M, P, isotypes).
M. punicifolia var. *obovata* Niedenzu, Gen. Malpighia 8. 1899. TYPE: Puerto Rico, *Sintenis 1596* (G, lectotype; G-BOIS, M, P, isotypes).
M. punicifolia auct., non. L.

Erect *shrub* to small *tree* to 6(–8) m tall, young branches, petioles and leaves green, strigillose, older branches smooth or more commonly with prominent, whitish or yellowish, round lenticels. *Leaves* subchartaceous to chartaceous, rarely subcoriaceous, borne laxly along the branches, internodes (2–)3–4(–5) cm long, or more commonly crowded in short shoots, internodes ca. 1.0 mm long; petioles slender, usually glabrous (1–)1.5–3.0(–4) mm long; blades variously elliptic-obovate, lanceolate-obovate, oblong-obovate or obovate, rarely ovate or

widely orbicular-obovate, obtuse, usually emarginate or rarely acute at apex, acute to cuneate or rarely somewhat obtuse at base, (1–)2–5.5(–8.5) cm long, 0.7–2.5(–5) cm wide, smooth, midvein prominent below; stipules free; reddish or green, decidous or not, strigillose when young, becoming glabrous, subulate, ca. 1 mm long. *Inflorescence* (1–)2–4(–6)-flowered, a sessile or sub-sessile, strigillose to densely strigillose, umbel-like panicle 1.5–2(–2.5) cm long; common peduncle short or none, 0–5(–13) mm long, flowering peduncle (3–)4–7 mm long; bracts and bracteoles 1–1.5(–2) mm long; pedicels (6–)7–10(–12) mm long, ca. 2 times the length of the flowering peduncles; buds unkeeled, subglobose, 3–5 mm diam. *Flowers* (1–)1.3–1.7(–2) cm diam., sepals densely strigillose in bud and fruit, glands 7–10, posterior glands 1.5–2(–3) mm long, about ½ the length of the sepals, anterior glands smaller, 0.5–1(–1.5) mm long or rarely all glands equal in size, posterior petal (6.5–)7.5–9(–12) mm long, lateral petals 5–9 mm long; anterior petals (4–)5.5–6.5(–8.5) mm long; androecium zygomorphic; filaments 3–4 mm long; lateral filaments (and usually the anterior filament too) obviously thicker than the others, curved inwards at anthesis, usually as long as those opposite the sepals; lateral anthers 1.2–1.5 mm long, the others 0.5–1 mm long; pollination gap short, 0–0.5(–1) mm long; gynoecium zygomorphic; styles (Fig. 9E) truncate or rarely somewhat uncinate at apex, lateral styles (2.5–)3–3.5(–4) mm long, obviously thicker and 0.5–1 mm longer than the anterior, curved at the base, usually straight and ascending for the rest, anterior style straight. *Fruit* subglobose, depressed at the poles, 3–9-lobed, 1–3 cm diam., very fleshy; pyrenes ovoid, 0.7–1.5 cm long, 5–12 mm wide, the dorsal wing well developed, to 3.5 mm wide in cultivated plants, small and almost obsolete in wild populations; intermediate wings absent.

Malpighia emarginata is known in Panama only as a cultivated plant. It is commonly called "Acerola" or "Grosella" (West Indian Cherry).

In Panama the species flowers and fruits occasionally throughout the year.

Malpighia emarginata is widely cultivated throughout the tropics for its fruit, which has a high content of vitamin C. It was long incorrectly called *Malpighia punicifolia*. It is recognized by its large, lobed fruits and its obovate leaves crowded in short shoots.

COCLÉ: District of Pintada, *Escobar 8* (PMA). LOS SANTOS: Pocrí, *Dwyer 2519* (MO). PANAMÁ: Panama City (probably cultivated), *Tyson 4451* (MO).

3. **Malpighia glabra** L., Sp. Pl. 425. 1753. TYPE: herb. Linn. (LINN 588.1).—FIG. 9G–H.

M. punicifolia L., Sp. Pl. ed. 2: 609. 1762. TYPE: herb. Linn. (LINN 588.4).
M. nitida Mill., Gard. Dict. ed. 8, no. 5. 1768, non Jacq., 1760. TYPE: Seeds collected in "Carthagena, New Spain," by Dr. Houston, grown by Miller (BM).
M. fallax Salisb., Prodr. Stirp. Hort. Chapel Allerton Vigen. 318. 1796. TYPE: unknown.
M. biflora Poir. in Lam. & Poir., Encycl. Méth. 4: 326. 1787. TYPE: *M. biflora* Dict. no. 3, ex herb. Lamarck (P).
M. semeruco Juss., Malpighia Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 336. 1840. TYPE: Venezuela, Zulia: "Maracaybo ad Perija," *Plée* (P-JU 11.468, holotype).
M. peruviana Moric., Pl. Nouv. Amér. 109. *t. 67*. 1841. TYPE: Based on *M. lucida* Pav. ex Moric.
M. undulata A. Juss., Arch. Mus. Hist. Nat. 3: 266. 1843. TYPE: Mexico, Vera Cruz, *Linden 910* (P-JU 11.465, holotype).

M. glabra var. *acuminata* A. Juss., Arch. Mus. Hist. Nat. 3: 265. 1843. TYPE: Santo Domingo, *Nectoux* (P, holotype; P, isotype).
M. neumanniana A. Juss., Rev. Hort. Sér. 2, 5: 5. 1846. TYPE: Hort. Paris, Nov. 1844–Dec. 1845. (P-JU 11.466, holotype).
M. glabra var. *antillana* Urb. & Niedenzu in Niedenzu, Gen. Malpighia 5. 1899. TYPE: Jamaica, 2500 ft, *Harris 6087* (NY, lectotype; BM, isotype).
M. glabra var. *guatemalensis* Niedenzu, Gen. Malpighia 5. 1889. TYPE: Guatemala, Amatitlán, 3900 ft, *Donnell-Smith 2556* (US, lectotype; G, G-BOIS, GH, M, isotypes).
M. glabra var. *lancifolia* Niedenzu, Gen. Malpighia 5. 1899. TYPE: Culta Horto Monacensi 1853 (M, lectotype).
M. glabra var. *typica* Niedenzu, Gen. Malpighia 5. 1899. TYPE: Guatemala, Dept. Santa Rosa: *Heyde & Lux (Donnell Smith 6080)* (K, lectotype; US, isotype).
M. glabra var. *undulata* (A. Juss.) Niedenzu, Gen. Malpighia 5. 1899. TYPE: *M. undulata* A. Juss.
M. oxycocca var. *biflora* (Poir.) Niedenzu, Gen. Malpighia 14. 1899. TYPE: *M. biflora* Poir.
M. lucida Pav. ex Moric. pro syn., Pl. Nouv. Amér.: 109. *t. 67*. 1841, non Mill. 1768. TYPE: "Perou," *Pavon* (G, holotype ex herb. Moric.).
M. myrtoides Moritz ex Niedenzu, pro syn., Malpigh. (Pflanzenr. 141(94):) 638. 1928. TYPE: Colombia, *Moritz 1707* (NY, holotype; K, isotype).
M. virgata Pav. ined., based on *Sesse & Mociño 118* (MA).
M. dicipiens Sesse & Moc., based on Flora Mexicana Icones, ined. 136 (G).

Prostrate *shrub* to small *tree* 1–3(–10) m tall; young branches green, sparsely strigillose, becoming glabrous, smooth or with prominent lenticels. *Leaves* chartaceous to sub-coriaceous, ovate-lanceolate to elliptic-lanceolate to ovate, acuminate or rarely acute at apex, acute to cuneate or rarely rounded at base, (2–)3–7.5(–11) cm long, (1–)1.5–4(–5.5) cm wide; petioles glabrous or sometimes strigillose when young, (1–)1.5–2(–3) mm long; stipules free, green or reddish, strigillose when young, becoming glabrous, subulate, 0.5–1 mm long. *Inflorescence* (2–)4–6(–8)-flowered, pedunculate, umbel-like, rarely raceme-like panicle, 1.5–3(–4) cm long; common peduncle slender, green or reddish, strigillose or rarely glabrous, (2–)5–12(–25) mm long; flowering peduncles green, glabrous or sometimes sparsely strigillose, (2–)3–5(–7) mm long; bracts 1–1.5(–2) mm long, bracteoles 0.5–1 mm long; pedicels green, glabrous or nearly so, (5–)7–11(–15) mm long, sometimes with small malpighiaceous bristles at tip forming a collar below the sepals. *Flowers* (1–)1.3–1.8(–2) cm diam.; buds (3–)4–5(–6) mm diam., unkeeled; sepals strigillose in bud, becoming glabrous or nearly so, glands 6, 1.5–2.5(–3) mm long, about ¾ as long as the sepals, rarely glands 7–10 but extra glands very small; posterior petal (6–)6.5–9.5(–11) mm long, limb sometimes sharply reflexed, lateral petals (5–)5.5–7(–8.5) mm long; anterior petals (4–)5.5–6.5(–8) mm long; androecium actinomorphic, all filaments filiform, equal in thickness or nearly so, straight, (2–)2.5–3(–3.5) mm long; anthers about equal in size or lateral anthers slightly larger than the rest, 0.8–1.2 mm long; pollination gap 0.5–1 mm long; gynoecium actinomorphic; styles (1.5–)2–2.5(–3) mm long, apex obtuse or truncate; ovary unlobed, long. *Fruit* pyramidato-globose, usually smooth and unlobed, 1–1.5 cm diam.; pyrenes ovoid, 7–10 mm long, 5–7 mm wide; dorsal wing entire, ca. 1 mm wide, lateral wings undeveloped, margin tuberculate or verrucose, intermediate wings absent.

Malpighia glabra grows in a wide variety of habitats from wet ravines or river banks to road sides, lowland moist forest, and dry limestone, rocky hillsides; from 0–1,600 m elevation, from coastal regions to the highlands of Guatemala.

The species flowers and fruits in Panama throughout the year.

Malpighia glabra is one of the most variable species in the genus. Several

ecotypes are found throughout its range, such as vine-like prostrate shrubs in the road sides of northern Mexico and Texas, small shrubs in Texas, Mexico and Jamaica, and large shrubs or small trees throughout its range. In Panama, *M. glabra* is a large shrub or small tree. It is rarely cultivated throughout its range. In Panama the species occurs principally in tropical moist forest but has also been collected in premontane moist forest and premontane wet forest life zones.

CANAL ZONE: BARRO COLORADO ISLAND: *Foster & McDade 2896* (MO). Farfan Beach area, *Lazor 5352* (MO, NY). CHIRIQUÍ: Progreso, *Cooper & Slater 182, 292* (both F), *293* (F, NY, US). Boquete, 3800 ft, *Davidson 1065* (A, F, MO, US). DARIÉN: Río Yape, *Bristan 1395* (MO, OS). Santa Fé, Río Sabana, 1–4 mi upstream, *Duke 4132, 4150* (MO). Mulatuppu, *Duke 8541* (MO). Río Pucro below village of Pucro, *Duke 13140* (MO). Without further locality, *Duke 14115* (MO). Between Río Penusa and Río Pucre, *Duke 14640* (MO, OS). Río Tuquesa, 250 m, *Mori 7014* (MICH, MO, PMA, US). LOS SANTOS: 11 mi N of Tonosí, *Tyson et al. 2961* (G, MO). PANAMÁ: Between Río Bayano Dam and Cañitas, *D'Arcy 9394* (MO). Between Cañasas and Sabalo, 100 m, *Duke 14476* (MO, OS). From Tortí to the Pilata del Toro, *Folsom & Demonti 4994* (MO). Bella Vista, *Herbertio 136* (G, US). Vera Cruz beach, *Lewis et al. 3006* (MO). SAN BLAS: Isla Soskatupu, *Duke 8934, 8959* (MO); *Elias 1696* (MO). Forests around Puerto Obaldía, *Pittier 4232* (US), *4282* (A, F, NY). Nargana Airport, *Tyson & Dwyer 1169* (MO, SCZ). VERAGUAS: NW of Santa Fé, 8.8 km from Escuela Agrícola Alto de Piedra, *Mori et al. 3907* (MO). WITHOUT LOCALITY: (probably Darién), *Bristan 1522* (MO).

4. **Malpighia romeroana** Cuatr., Webbia 13: 561. *f. 33: l, m*; *f. 34*. 1958. TYPE: Colombia, Santander, near Barrancabermeja, *Romero Castañeda 4894* (COL, holotype; US, isotype).—FIG. 9E, I.

M. mayana Lundell, Wrightia 5: 242. 1976. TYPE: Guatemala, Petén, La Cumbre, *Lundell & Contreras 19882* (LL, holotype, not seen).

Erect *shrub* 1–2(–5) m tall, rarely a climber; young branches reddish to violet, glabrous or essentially so. *Leaves* chartaceous, elliptic to elliptic-oblong, acuminate to cuspidate at apex, acute at base, (9–)10–17(–20) cm long, (2–)3–6.5 (–10) cm wide, smooth or sometimes upon drying somewhat crinkled or puckered above, midvein very prominent; petioles robust, glabrous or nearly so, (2.5–)3–4(–5) mm long; stipules usually united, appearing as one, dark red or black, strigillose, linear-lanceolate, 2–3(–4) mm long. *Inflorescence* a (4–)10–30(–50)-flowered, lax, raceme-like panicle; somewhat strigillose at least when young, flowering axis, common peduncle and rachis (1–)2.5–6 cm long; common peduncle robust, (1–)1.5–2.5(–4) cm long, bibracteolate near the middle; rachis (0.5–)1–2(–2.5) cm long; flowering peduncles 2–4(–5) mm long; bracts 1.5–2.5(–3.5) mm long; bracteoles (0.5–)1(–1.5) mm long; pedicel (5–)7–11 mm long, 2–3 times as long as the flowering peduncles. *Flowers* 1–1.5 cm diam.; buds 3–5 mm diam., keeled, keels ca. 0.5–0.7 mm wide, decurrent at the apex; sepals glabrous, glands 6, 2–3(–4) mm long, as long as or slightly shorter than the sepals; posterior petal (6–)6.5–8(–8.5) mm long, lateral petals 6–7 mm long, anterior petals 4.5–6 mm long; filaments (2–)2.5–3(–3.5) mm long, lateral filaments straight or somewhat curved inwards, obviously thicker than the others, shorter or longer than those opposite the sepals; anthers ca. 1 mm long, pollination gap ca. 1 mm long; ovary obviously 3-lobed; the styles uncinate at the apex, lateral styles 2–4.5 mm long, obviously thicker and usually 0.5 mm longer than the anterior, curved inwards at anthesis, the anterior styles straight or nearly so. *Fruit* pyramidal-globose, 1–1.2 mm diam.; pyrenes ovoid, 7–10 mm long, 5–7 mm wide; dorsal wing sharp,

entire, 1–2 mm wide, lateral wings thick and tuberculate or none, intermediate wings absent.

Malpighia romeroana grows in wet to swampy forests and riverine areas, in lowlands with mean annual precipitation 115–400 cm. It ranges from Mexico (Nayarit) south to Colombia. In Panama it is found in wetter parts of tropical moist forest and premontane wet forest.

The species flowers from August to October, during the second half of the rainy season.

BOCAS DEL TORO: Trail to Río Abajo, 3 km SW of Almirante, 100–200 m, *Nee & Hansen 14114* (MO). Water Valley, *Wedel 911* (MO). CANAL ZONE: Fort San Lorenzo, *Allen 5122* (F). Mojinga Swamp, lower Chagres River, *Bartlett & Lasser 16857, 16859* (both MO). Road S-11, NW of Escobal, *Croat 12454* (F, G, MO, SCZ). N base of Mindi Hills along Quebrada Morito, *Johnston 1635* (MO). End of Pipeline Road, *Mori & Kallunki 1726* (MICH, MO, PMA, RSA, US). Pipeline Road, 16.8 km from Gamboa Gate, *Mori & Kallunki 1766* (K, MO). Trail along Río Petupie from road to Fort Sherman from Gatun Locks (S2), *Mori & Kallunki 2698* (MO, PMA). Fort Sherman, *Tyson & Blum 1673, 1674* (MO, SCZ). Old Fort San Lorenzo, *Tyson 2227* (MO, SCZ). BARRO COLORADO ISLAND: *Bangham 518* (F, US); *Croat 5985, 6716, 8207, 12486* (all F, MO, NY, SCZ); *Foster 666* (PMA); *Shattuck 511* (F, MO); *Weaver & Foster 1590* (MO, PMA), *1617* (DUKE, PMA). COLÓN: E of Santa Rita Ridge lumber region, *Correa 636* (MO). Río Guanche above bridge, 50–200 m, *Croat 36956* (MO). Along Río Viejo, between Portobelo Road and Quebrada Ruiz, 4 km N of Puerto Pilón, 5 m, *Nee 7198* (MO, PMA US). DARIÉN: El Real, 15 m, *Allen 971* (G, MO). Río Pirre, *Bristan 1490* (MO). Near El Real, *Duke & Bristan 286* (MO, OS). PANAMÁ: El Llano, *Duke 5511* (CAS, MO), *5851* (G, MO, PMA, US). Just S of La Capitana, *Tyson 6767* (MO, PMA). SAN BLAS: Canal just N of Mandinga Airport, *Duke 14836* (MO, OS). VERAGUAS: 10 km NW of Santa Fe, road to Calovébora, *Mori & Bolten 7647* (F, MO, NY, US).

9. MASCAGNIA

Mascagnia Bert. in Colla, Hortus Ripul. 86. 1824. TYPE: *Mascagnia americana* Bert.

Lianas. *Leaves* opposite, simple, entire, petiolate or subsessile with some glands, coriaceous, papyraceous or membranaceous; stipules small, at the base of the margin of the petiole. *Inflorescences* axillary or terminal, of pseudoracemes, corymbs, or rarely umbels, these solitary or arranged in panicles; pedicels pedunculate; bracts and bracteoles conspicuous. *Flowers* with the sepals ovate or ovate-oblong, usually 4 sepals bearing glands, or rarely fewer or all 5 glandular; petals clawed, yellow, white, red, or violet, usually glabrous, sometimes sericeous dorsally, the limb ovate, obovate or suborbicular, the margin sinuate, crenate or fimbriate, the interior petal sometimes glandular; stamens 10, usually glabrous, only slightly unequal or the pair of lateral posterior stamens larger than the rest, the filaments united at the base, the anthers ellipsoid or somewhat oblong; styles straight or somewhat sigmoid, glabrous or pubescent at the base, the apex truncate with the inner angle stigmatic, protruding or depressed, the posterior angle obtuse, acute or apiculate, the ovary trilobed, villose, hirsute or tomentose, rarely glabrescent. *Fruit* a schizocarp of 3 samaras, these with 1 lateral wing discoid, continuous around the seminiferous area or with 2 lateral wings shaped like butterfly wings, the seminiferous area also bearing a dorsal crest or narrow wings and sometimes also small supplementary wings or tubercles between the dorsal and lateral appendages; cotyledons almost equal, incumbent.

Mascagnia is a Neotropical genus of about 50 species ranging from Mexico to northern Argentina, but predominantly from Brazil. Its elevational range is from sea level to 1,000 meters or rarely as high as 1,500 meters. See Cuatrecasas (1958: 565–588) and Triana & Planchon (1862)

a. Samaras with a single circular wing around the body, membranaceous, hyaline, radially nervate and veiny-reticulate; petals pink ---------- 3. *M. nervosa*
aa. Samaras with the main wing deeply divided into 2 divergent, opposite, lateral wings with parallel or subparallel divergent venation; petals yellow, purplish or reddish.
  b. Leaves densely appressed sericeous on the lower surface; petals yellow.
    c. Inflorescences profusely branched, axillary and terminal, much larger than the leaves and forming a large compound floribund cymose-paniculate thyrse, the branches robust, with conspicuous thickened nodes; lateral wings of samara acutely and deeply dentate along the outer margin, 15–23 mm long, the dorsal wing 1–3 mm high; leaves subcoriaceous with marginal glands, abaxially ochro-leucous sericeous; stems conspicuously sericeous ---- 5a. *M. sericans* ssp. *buricana*
    cc. Inflorescences axillary, much shorter than the leaves with only a double cymose trifurcation, the short and slender branching with no conspicuous thickened nodes; lateral wings of samara obtusely sinuate along outer margin, 10–15 mm long, the dorsal wing absent; leaves membranaceous without marginal glands, abaxially cinereous sericeous with metallic shine; stems glabrous or nearly so ---------- 1. *M. dukei*
  bb. Leaves sparsely pubescent, puberulous, or glabrous; petals yellow, purplish or reddish.
    d. Petals purplish or reddish ---------- 6. *M. violacea*
    dd. Petals yellow.
      e. Lateral wings of samara thin membranaceous, broadly flabellate, 25–30 mm high, 25–35 mm broad, the medial wing 30 mm high ---------- 2. *M. hippocrateoides*
      ee. Lateral wings of the samara subcoriaceous, thick and rigid at maturity, 5–7 × 10–14 mm, broadly trapezoidal, obtusely undulate or crenate, the medial wing short, 1–2 mm high ---------- 4. *M. platyrachis*

1. **Mascagnia dukei** Cuatr. & Croat.[13] TYPE: Panama, *Duke 14468* (US-2629912, holotype; MO-1947403, PMA, isotypes).

Lianas; stems brown, glabrous or nearly so even from the earliest stages, conspicuously lenticellate. *Leaves* opposite, membranaceous, elliptic to oblong-elliptic, abruptly to gradually acuminate at the apex, acute to obtuse at the base, 5.5–13.0 cm long, 2.0–5.5 cm wide, glabrous above, densely whitish-sericeous beneath, eglandular or sparsely and obscurely glandular along the midrib on the upper surface, the margin entire, scarcely or not at all revolute, eglandular, the midrib flat to weakly sunken, the primary lateral veins 4–6 pairs, markedly arcuate-ascending at ca. 50 degree angle, the reticulate veins scarcely or not at all prominulous; petioles canaliculate, sericeous, 5–9 mm long. *Inflorescences* axillary, shorter than the leaves, the flowers in cymes of 2 or 3, arranged in small panicles less than 2 cm long, of 1–2 short, usually trifurcate, branching divisions; axes and branches sericeous; bracts narrowly lanceolate, 2–3 mm long, sericeous

[13] *Mascagnia dukei* Cuatr. & Croat, spec. nov. Folia opposita membranacea, elliptica vel oblongo-elliptica, 5.5–13 × 2–5.5 cm, supra glabra, subtus dense adpresseque sericea, cinereo-nitentia, margine integra. Inflorescentiae quam folia valde breviores, axe minimo saepe 1–2-plo cymoso-trifurcato, ramis brevibus 2–4 mm longis, sicut pedunculis pedicellisque sericeis. Samarae alis lateralibus chartaceis, flabellatis margine obtuse sinuata, adpresse cinereo-pubescentibus, 10–15 mm longis 7–10 mm altis, ala dorsali nulla.

outside, glabrous within except near the base, sometimes with a pair of sessile, plate-shaped glands; peduncles 1.5–4.0 mm long, these with a pair of ovate bracteoles at the apex, the bracteoles pubescent outside near the base, glabrous within; pedicels 11–13 mm long in fruit, slender; pedicels and peduncles sericeous. *Flowers* with the sepals ovate to ovate-oblong, rounded at the apex, ca. 2 mm long, sericeous except near the margins, 1 sepal eglandular, the others bearing a total of 7 or 8 oblong, glabrous glands ca. 1.5 mm long; petals not seen; stamens to ca. 2 mm long, the filaments glabrous, flattened, the anthers oblong, ca. 0.9 mm long; ovary densely pubescent, the styles glabrous, ca. 2.5 mm long, truncate at the apex with the inner angle obtuse, the outer margin narrowly pointed. *Fruit* a schizocarp of 3 samaras, pale brown, the lateral wings flabellate, weakly sinuate on the outer margin, 10–15 mm long, 7–11 mm wide, the dorsal wing absent; seminiferous area oblong, 3–6 mm long, 1–2 mm diam., villous to sericeous, the surface not at all visible.

Mascagnia dukei is known only from the type from tropical moist forest in eastern Panamá Province which had fruits in September. The species is closest to *M. sericans* ssp. *buricana* but can be distinguished from that subspecies by its fruits with weakly sinuate outer margins and the leaf margin which is eglandular.

Mascagnia dukei is well characterized by the combined features of its leaves and fruits. The leaves seem to agree with those described by Grisebach for the scarcely known *M. stannea* (Griseb.) Niedenzu from Nicaragua. But the Grisebach Nicaraguan species differs basically from *M. dukei* on account of its inflorescences, which are probably similar to those of *M. sericans*.

PANAMÁ: Between Cañasas and Sabalo, ca. 100 m, *Duke 14468* (MO, PMA, US).

2. **Mascagnia hippocrateoides** (Triana & Planch.) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 3: 24. 1908.

Hiraea hippocrateoides Triana & Planch., Prodr., Ann. Sci. Nat. Bot. Sér. 4. 18: 328. 1862. TYPE: Colombia, Anapoima, *Triana 5568-1* (COL, US, isotypes).

Lianas, growing into canopy to ca. 30 m; stems glabrescent. *Leaves* opposite, ovate to oblong-ovate or ovate-elliptic, acuminate to cuspidate at the apex, rounded at the base, 5.5–20.0 cm long, 3–10 cm wide, glabrous, subcoriaceous, the margin weakly revolute; petioles 7–15 mm long, canaliculate, biglandular between the middle and the apex, the glands thick, subglobular, 2–3 mm broad. *Inflorescences* axillary and terminal, shorter than the leaves, of racemes in panicles to 25 cm long; bracteoles paired at the nodes of the inflorescence, 2–12 mm long, the larger ones near the base often toothed, 1 of each pair with a large gland; axis and branches of inflorescence and pedicels moderately pubescent and somewhat ferruginous with short T-shaped trichomes, axis and branches flattened; pedicels 2–4 mm long, enlarged at the apex, appearing articulate just below the flower; peduncles 5–12 mm long with 2 small bracteoles and a large sessile gland at the apex. *Flowers* 18 mm diam.; sepals orbicular, 1.5–3.0 mm long, oblique on the pedicel, curved inward against the stamens, the lateral margins ciliate, turned outward, glands 9, most sepals with 2 irregular greenish glands 1.5–2.0 mm long;

petals 5, clawed, subovate to obovate, 4 of them yellow, rounded at the apex, undulate and rounded to truncate at the base, 8–10 mm long, entire, the fifth petal orange, at least on the margin, minutely undulate and fimbriate, 11–13 mm long, to 7 mm wide, usually held somewhat erect and higher than the entire petals; stamens 10, glabrous, spreading, unequal, curved, 3 directed toward the orange petal between 2 of the styles, the longest to 4 mm long, the anthers nearly as broad as long; ovary 3-parted, each part with 3 ribs, densely pubescent, the ovary hirsute; styles 3, somewhat spreading, to ca. 4 mm long, the apex subspatulate, the inner angle protruding, obtuse, stigmatic, the dorsal angle apiculate or frequently uncinate. *Fruit* a schizocarp of 3 samaras; dorsal wings small, to ca. 5 mm long, the lateral wings membranaceous, broadly fan shaped, 1.8–2.5 cm long, 1.7–3.5 cm wide, the dorsal wing to 5 mm high, glabrate, the body 4–6 mm wide, suborbicular-conoid, sparsely appressed-pubescent with short, T-shaped trichomes.

Mascagnia hippocrateoides is known from Panama, Colombia, and Ecuador at elevations of 100–700 meters. In Panama it has been collected only in tropical moist forest on Barro Colorado Island and in what is either premontane wet forest or tropical wet forest at Altos de Pacora, northeast of Cerro Azul in Panamá Province. In Panama, the species flowers in May and June. Fruits are probably mature in about one month.

CANAL ZONE: BARRO COLORADO ISLAND: *Croat 11648* (MO), *14845* (DUKE, MO, PMA), *14867* (DUKE, MO, NY, SCZ); *Foster 880* (DUKE, F, MO, PMA), *2321* (MO, PMA, SCZ), *2313* (DUKE, PMA); *Siri 1007* (MO). PANAMÁ: Altos de Pacora, 20–24 km NE of Cerro Azul, *Dressler 4663* (MO).

3. **Mascagnia nervosa** Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 3: 12. 1908. TYPE: Venezuela, Topo, *Otto 904* (B, not seen; F, photo FM 12692).

Lianas or scandent *shrubs* to 3 m or longer; stems with sparse T-shaped trichomes when young, glabrate in age. *Leaves* opposite, ovate-elliptic to ovate, acuminate, obtuse to rounded at the base, 7–16 cm long, 4.5–9.0 cm wide, chartaceous, glabrous above, glabrous below or with moderate to dense T-shaped trichomes on the veins, especially the midrib, with 2 sessile glands at the base beside the midrib below, the margin thickened, revolute, the primary lateral veins (4–)5(–6) pairs, arcuate-ascending, the reticulate veins prominulous, with a pair of usually pale, sunken, conspicuous glands at the base; petioles 7–16 mm long, sparsely pubescent, eglandular. *Inflorescences* axillary, thyrsoid, divaricately branched, bracteolate at the nodes; branches, pedicels, and sepals short-pubescent; branches ending in a corymb of 4–12 flowers; bracts linear-lanceolate, puberulent, 5–10 mm long; pedicels pedunculate, 8–18 mm long; peduncles ca. 2 mm long, thicker than the pedicels, minutely bracteolate at the apex. *Flowers* 10–12 mm diam.; calyx with usually 8 large green glands; sepals 5, ovate-oblong, 1.5–2.0 mm long, glabrous to sparsely pubescent; petals pink, clawed, ovate-oblong, membranaceous, glabrous, subequal, 4.0–4.5 mm long, keeled, entire, the claw 2 mm long; stamens 10, unequal, 2 much larger than the others, ca. 2 mm long, glabrous, the anthers oblong, introrse, yellowish, the connective conspicuously swollen on the outer side; ovary densely whitish-hirsute, the apex

thickened, truncate with the inner angle stigmatic and apiculate, the dorsal angle sterile, right or obtuse; styles 3, ca. 2.5 mm long, suberect, exceeding the stamens, thick with a narrow lateral arm at the apex, glabrous. *Schizocarp* of 3 samaras, the dorsal wings reduced, the lateral wings membranaceous and translucent, semicircular, 1.8–2.5 cm long, 2.0–3.5 cm wide, often united at the apex forming an almost entire disc, radially veined with the reticulate veins prominent, the margin weakly sinuate, the dorsal wing reduced, narrow, ca. 1 mm wide, the seminiferous area moderately appressed-pubescent.

Mascagnia nervosa ranges from Panama to Colombia, Venezuela, and Trinidad at elevations of 0–600 meters. In Panama the species has been collected most frequently in tropical moist forest, but it also occurs in tropical dry forest and premontane moist forest. The species is distinguished by its numerous, transparent, disc-shaped fruits. Other species of *Mascagnia* in Panama have fruits shaped like butterfly wings. The species flowers sporadically, mostly in the rainy season, March to October, with the fruits maturing from April to October.

CANAL ZONE: Corozal to Pedro Miguel, *Cowell 399* (NY). Curundu Survival School, *Gentry 1468* (MO). BARRO COLORADO ISLAND: *Aviles 93b* (MO); *Bangham 410* (F, US), *602* (F); *Croat 11681* (DUKE, F, MO, NY), *11864* (MO); *Foster 1132* (PMA), *1184* (DUKE, F, MO, PMA); *Montgomery 125* (MO); *Shattuck 968* (MO), *1057, 1156* (F, MO, US); *Woodworth & Vestal 744* (F). DARIÉN: Boca de Cupe, 40 m, *Allen 902* (F, G, MO, NY). 10 mi S of El Real on Rio Pirre, House #22, *Duke 5484* (G, MO). Boca de Cupe, *Williams* (NY). PANAMÁ: Santa Rosa, *Bartlett & Lasser 16487* (MO). La Chorrera, *Chong 50* (MO, PMA). Bohio Soldado, *Cowell 248* (NY). Isla Tabaguilla, *Duke 5883* (MO, US). Taboga Island, *Gentry 5725* (GH, MO, NY). 2 mi S of Tocumen Airport, *Tyson & Clewell 5913* (SCZ). VERAGUAS: Isla de Coiba, *Mendez 130* (US).

4. **Mascagnia platyrachis** (Triana & Planch.) Cuatr., Webbia 13: 374. 1958.

Hiraea platyrachis Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 328. 1862. TYPE: Colombia, Istmo de San Pablo, *Triana* (G, not seen; F, photo, FM 24288).

Mascagnia hippocrateoides var. *platyrachis* (Triana & Planch.) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 3: 24. 1908.

Lianas; stems glabrous or nearly so. *Leaves* opposite, elliptic-ovate, acuminate and down-turned at the apex, usually obtuse at the base, rounded elsewhere, 7–23 cm long, 3.0–11.5 cm wide, glabrous, subcoriaceous, entire or somewhat glandular-denticulate toward the apex, glands lacking at the base of the blade; petioles 9–20 mm long, canaliculate, biglandular between the middle and the apex, the glands drying thick, subglobular, 1.5–2.0 mm diam. *Inflorescences* axillary or terminal, shorter than the subtending leaves, of 10–14-flowered racemes in corymbose panicles; axis and branches flattened, sparsely to densely ferruginous-puberulous; bracts lanceolate, puberulous, 3–5 mm long; peduncles 6–11 mm long, thick, the bracteoles apical, ovate, 1.0–1.5 mm long, 1 glandular; pedicels 2–4 mm long, thickened, puberulous. *Flowers* 18 mm diam.; sepals suborbicular or elliptic, 2.0–2.5 mm long, sericeous-pubescent, glandular, the glands 10, ellipsoid, 2–3 mm long; petals thickly membranaceous, subovate to suborbicular, clawed, 5–6 mm long, the 4 lateral petals yellow, the margin entire, the interior petal orange, the margin fimbriate; stamens 10, glabrous; style thick, glabrous or nearly so, the ovary villous, somewhat curved-divergent, 4–5 mm long, the apex subspatulate with the internal angle protuberant, obtuse and stigmatic, the outer part apiculate or uncinate. *Fruit* a schizocarp of 3 samaras, the lateral wings

suberose-coriaceous, trapezoidal, sericeous when young, glabrous in age, 5–7 mm long, 10–13 mm wide, the dorsal wing coriaceous, 1–2 mm high, the seminiferous area 8 mm long, smooth, weakly appressed-pubescent when young, glabrescent.

Mascagnia platyrachis is known from the west coast of Colombia and Panama at elevations from 0–400 meters. In Panama it has been collected only in tropical wet forest. It has been found in flower in May.

Mascagnia platyrachis is closely related to *M. hippocrateoides* and is difficult to distinguish in flower, although Panamanian collections of *M. platyrachis* have leaf blades merely obtuse at the base while those of *M. hippocrateoides* are rounded at the base. Fruiting collections of *M. platyrachis* are separated from *M. hippocrateoides* by the smaller size of the wings, 5–7 mm × 10–13 mm versus 2.5–3.5 × 3.2–3.5 cm for *M. hippocrateoides*. In addition, the lateral wings are flabellate in *M. hippocrateoides* and trapezoidal and thicker in *M. platyrachis*.

COLÓN: Trail along first river W of Portobelo, *Gentry 5157* (MO, NY). Santa Rita Ridge, ca. 4–5.5 mi E of Transisthmian Highway, *Lewis et al. 5294* (F, MICH, MO, NY, PMA, RSA, US). WITHOUT LOCALITY: *Foster 2313* (GH).

5. **Mascagnia sericans** Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 3: 21. 1908. TYPE: Bolivia, Dept. Santa Cruz, Prov. Sara, Camposgebusch bei Buenavista, 500 m, *Steinbach 6214* (not seen).

5a. **Mascagnia sericans** Niedenzu ssp. **buricana** Cuatr. & Croat.[14] TYPE: Panama, *Croat 22495* (MO-2166300, holotype; isotypes, 4 sheets distributed as *Mascagnia* aff. *sericans*).—FIG. 10.

Lianas, the stems whitish-sericeous, the lenticels soon showing through the pubescence. *Leaves* opposite, subcoriaceous, elliptic to oblong-elliptic, obtuse and cuspidate at the apex, usually rounded at the base, sometimes broadly acute, 5–12 cm long, 2.3–5.5 cm wide, glabrous above, densely ochroleucous-sericeous beneath, sparsely glandular along the midrib on the upper surface, the margin weakly revolute and glandular dentate, sometimes with large, thick glandular depressions, primary lateral veins 5 or 6 pairs, markedly arcuate-ascending at ca. 50 degree angle, the midrib drying sunken, reddish above, the reticulate veins weakly prominulous; petioles 6–10 mm long, canaliculate, sericeous, usually bearing a pair of thick, globular glands between the lower ⅓ and the middle. *Inflorescences* terminal and upper axillary, of racemes disposed in panicles; axes and branches slightly flattened, brownish, sericeous to tomentose, the nodes thickened; bracts lanceolate, to ca. 5 mm long, bearing a pair of large glands in the lower ⅓, these ca. 1 mm diam., truncate and broadest at the apex; peduncles 2.0–2.5 mm long, subtended by a bract at the base, bibracteolate at the apex, the

[14] *Mascagnia sericans* Niedenzu ssp. *buricana* Cuatr. & Croat, ssp. nov. Folia subcoriacea elliptica vel oblongo-elliptica apice obtusa et cuspidata vel acutiuscula, 5–12 × 2.3–5.5 cm, subtus dense adpresseque ochroleuco-sericea, margine leviter recurvata, remote dentato-glandulata. Inflorescentiae quam folia majores, valde ramosae, internodiis plus minusve complanatis dense pubercentibus, nodis incrassatis. Samarae alis chartaceis rigidulis, flabellatis, argute acuteque lentatis, 15–23 × 8–13 mm, stramineis, dense adpresseque subsericeo-pubescentibus, ala dorsali 1–3 mm longa.

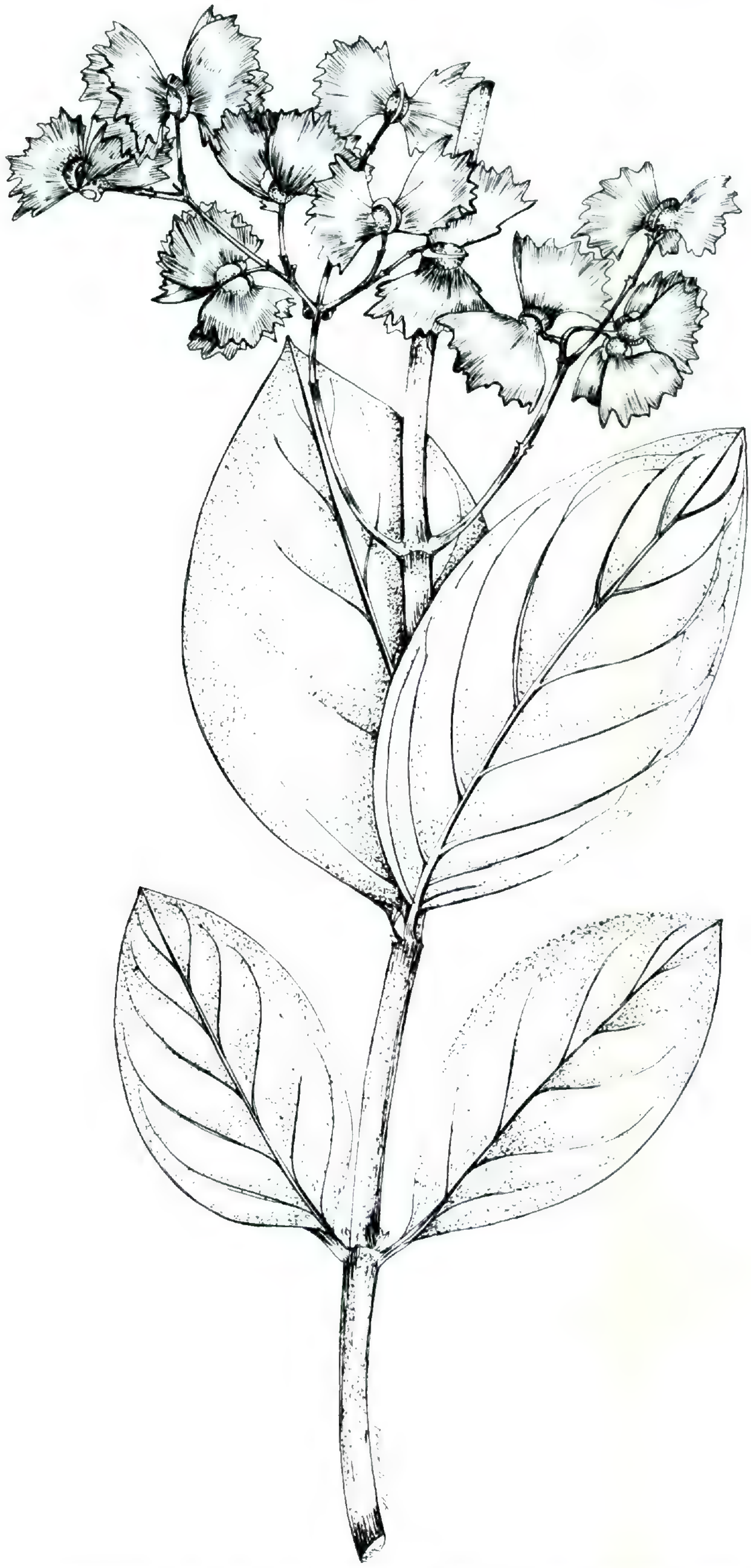

FIGURE 10. *Mascagnia sericans* ssp. *buricana* Cuatr. & Croat. Fruiting branch (×¾). [After *Croat 22495* (MO).]

bracteoles ovate-triangular, 1.0–1.5 mm long, sericeous, at least medially on the abaxial surface, usually glabrous adaxially; pedicels 4.5–6.0 mm long in fruit, sericeous-tomentose; sepals oblong-ovate, 3.0–3.5 mm long, ca. 1.5 mm diam., appressed-pubescent at the base outside, otherwise glabrous, 4 sepals bearing 2 glands each, these oblong, thick, ca. 2 mm long; petals and other flower parts not seen. *Fruit* a schizocarp of 3 samaras, light yellowish-green, the lateral wings flabellate, acutely and deeply dentate on the outer margin, 15–23 mm long, 8–13 mm wide, cinereous appressed-pubescent throughout, the viscidulous surface showing through the pubescence, the nervation radial; dorsal wing 1–3 mm long; seminiferous area ellipsoid, 4.0–5.5 mm long, ca. 3 mm diam., weakly pubescent to glabrate, the weakly viscidulous surface usually visible.

Mascagnia sericans ssp. *buricana* is known only from the type locality, an area of tropical wet forest at about 200 meters elevation on the Burica Peninsula of Panama and Costa Rica. It has been found with mature fruits in February and March. It is distinguished by its sericeous lower leaf surface, its light yellowish-green fruits with dentate lateral wings, and by the glands on the leaf margins.

The features of its fruits and the elliptic shape of the leaves distinguish this Panamanian subspecies from the typical *M. sericans* Niedenzu of Paraguay, Bolivia, and Brazil. Subspecies *sericans* always shows larger and thicker, ovate-acuminate, or ovate lanceolate, acute leaves.

CHIRIQUÍ: Burica Peninsula, Rabo de Puerco, 8 km W of Puerto Armuelles, 50–150 m, *Croat 21964* (MO, US). Burica Peninsula, 8 mi W of Puerto Armuelles, primary forest, *Croat 22495* (MO).

6. **Mascagnia violacea** (Triana & Planch.) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 3: 14. 1908.

Hiraea violacea Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 327. 1862. TYPE: Colombia, "Valles del Magdalena y del Cauca, Anapoima," *Triana 5568-5*, (COL, isotype; F, photo FM 35636 of isotype at G).

Liana. *Leaves* opposite, papyraceous, ovate-lanceolate, acuminate at apex, rounded at the base, 4–13 cm long, 2–6 cm wide, the margin entire, narrowly revolute, glabrous on the upper surface except for the midrib, the secondary veins slightly conspicuous, the reticulate veins prominulous; lower surface with scattered appressed trichomes and more numerous patulous trichomes, the primary lateral veins of 4–5 pairs, ascending, the reticulate veins more or less prominent; glands at the base of the blade lacking but sometimes with small scattered glands. *Inflorescence* large, a terminal thyrsoid panicle; branches ferruginous or red, tomentose, bracts narrowly lanceolate, pubescent, 1–2 mm long; peduncles 1–3 mm long, hirsute; pedicels 5–8 mm long, slender, flexuous or erect, puberulent, 20–35 in each dense pseudoraceme. *Flowers* 12 mm diameter; sepals ovate, broadly obtuse, purplish, villous with the margin glabrescent; petals violet, membranaceous, glabrous, the blade rounded-obovate, entire, 5 mm long, 4 mm wide, the claw 1 mm long; filaments glabrous, 2 of them thicker; styles thick, 2 curved at the base, glabrous, spatulate at the apex with the internal angle protrudent, obtuse and stigmatic, the external angle somewhat acute, the ovary hirsute. *Samara* shaped like a butterfly, the lateral wings flabellate, subhyaline, 8–12 mm

long, 15–22 mm wide, membranaceous, venous-reticulate, softly pubescent, the outer margin crenate, the dorsal crest 1–2 mm high.

The species is known from Panama and northern Colombia at elevations of 300 to 1,000 m.

CHIRIQUÍ: Trail to Soledad, near Fortuna dam site, *Correa et al. 2091* (MO, PMA). Fortuna dam site, 1000 m, *Correa et al. 2545* (MO, PMA). COCLÉ: 18 km past Sardinilla on way to Nombre de Dios 150–300 m, *Croat 26092* (MO).

10. MEZIA

Mezia Schwacke ex Niedenzu, Pflanzenfam. 3(4): 58. 1890. TYPE: *Mezia araujei* Schwacke = *M. includens* (Benth.) Cuatr.

Shrubs or *lianas*; stems robust. *Leaves* opposite, coriaceous, stiff, eglandular; petioles with or without glands; stipules minute, interpetiolar. *Inflorescences* cymose-paniculate; bracts small; peduncle articulate at the apex and forming umbels of 3 or 4; pedicels short; bracteoles 2 at the articulation, obovate-orbicular, larger than the flower, enveloping the flower bud before anthesis. *Flowers* with the sepals 5, oblong, obtuse, soon reflexed, glabrous inside, densely pubescent outside, 4 sepals each with 2 concrescent glands; petals yellow, the limb obovate to suborbicular, the margins erose, the dorsal side villous-sericeous, the posterior petal smaller, ciliate and glandular; stamens 10, all fertile, slightly unequal, the filaments flat, glabrous, united at the base, the anthers obovoid, large, glabrous, the connective large, glandular; styles large, stiff, the apex somewhat enlarged, truncate with external angle raised and acute on 2 of the styles, the third shorter with apical angle rounded, the ovary villous. *Fruit* a schizocarp of 3 samaras; seminiferous area ovate-oblong; principal lateral wing suborbicular, continued at the base, membranous, large, the dorsal wing smaller, suborbicular; intermediate lateral wings semiorbicular-obovate, reduced on the posterior side; seeds oblong, acute; embryo straight; cotyledons subequal.

The genus *Mezia* consists of a single species in South America and Panama.

1. **Mezia includens** (Benth.) Cuatr., Webbia 13: 450. 1958.—FIG. 11.

Tetrapterys? *includens* Benth., London J. Bot. 7: 133. 1848. TYPE: French Guyana, *Martin* (not seen).
Stenocalyx involuta Turcz., Bull. Soc. Nat. Mosc. 31: 393. 1858. TYPE: Venezuela, Carabobo, *Funck & Schlim 518* (not seen).
Diplopterys involuta (Turcz.) Niedenzu, Arbeiten Bot. Inst. Köngl. Lyceums Hosianum Braunsberg 4: 17. 1912.
Mezia araujei Schwacke ex Niedenzu, Bot. Jahrb. 14, Beibl. 30: 3. 1892. TYPE: Brazil: Minas Gerais (not seen).
Diplopterys araujei (Niedenzu) Niedenzu, Arbeiten Bot. Inst. Königl. Lyceums Hosianum Braunsberg 4: 17. 1912.
D. includens (Benth.) Niedenzu, Malpigh. (Pflanzenr. 141(91):) 226. 1928.

Liana, the young branches angular, densely reddish-brown, appressed puberulent. *Leaves* opposite, coriaceous, stiff, ovate or elliptic, short-acuminate, obtuse to subrounded at the base, glabrous except for the midrib adaxially, scattered puberulous beneath with short-stalked, appressed T-shaped trichomes, 9–12(–21)

FIGURE 11. *Mezia includens* (Benth.) Cuatr. Branch with flowers and fruits (×3/5). [After *Mori & Kallunki 5120* (MO); the open flowers after *Tessman 4931* (MO).]

cm long, 4.0–6.5(–8.5) cm wide, primary lateral veins 3–6 on each side; petioles 1.2–2.0 cm long, minutely pubescent, biglandular at the apex. *Inflorescence* axillary or terminal, cymose-paniculate, branching with umbels of 3 or 4 flowers; axis and branches densely reddish-brown villous-pilose with thick reddish, sub-

appressed trichomes, angular and somewhat flattened; peduncles of each umbel thickened, angular, 5–10 mm long; basal bracts 2, oblong, 3–4 mm long, amplexicaul glandular; individual floral peduncles stiff, terete, 10–14 mm long, appressed rufous villous, supporting an obsolete 0.5 mm long pedicel and a pair of floral bracts at the apex, these 2 bracts obovate-orbicular, subcoriaceous, concave, ca. 1 cm long and 1.2 cm wide, appressed rufous pubescent, enveloping each flower bud. *Flowers* with sepals 4, oblong, obtuse, ca. 4(–7) mm long, ca. 2 mm wide, densely reddish-brown villous outside, reddish and glabrous inside, sepals each with 2 large, elliptic-oblong glands, 2.5–3.0 mm long; petals yellow, the limb obovate, cuneate at base, 8–10 mm long and wide, the margin erose, the claw thick, ca. 2 mm long; stamens slightly unequal, the filaments flattened, 2.5–3.0 mm long, glabrous; anthers 1.5 mm long, oblong, glabrous, the connective thickened, ellipsoid; styles thick, stiff, pilose towards the base, enlarged and truncate at the apex, 2 of them with dorsal angles elevated and acute, the third style shorter with the angle rounded; ovary villous. *Fruit* with the seminiferous area ovate-oblong, 12–14 mm long, ca. 8 mm wide, the ventral areole oblong, 10–11 mm long; wings 4(or 5), membranaceous, the lateral wings suborbicular, continuous with the base, parted at the apex, to 3 cm wide, minutely puberulous; dorsal wing semiorbicular, ca. 2 cm long, 1 cm wide; intermediate wings reduced to the posterior part, obovate-orbicular, 7–8 mm long and wide.

The species ranges from Panama to Colombia, Venezuela, French Guiana, Brazil, and Peru. In Panama it is known only from tropical wet forest east of the Canal Zone.

PANAMÁ: El Llano-Carti Road, 20.7 km from Inter-American Hwy, *Mori & Kallunki 5120* (MICH, MO, PMA, US).

11. PTERANDRA

Pterandra Juss., Malpigh. Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 328. 1840.
TYPE: *Pterandra pyroidea* Juss.

Shrubs or *trees*. *Leaves* opposite, coriaceous; stipules intraxillary, completely united or only connate at the base. *Inflorescences* axillary-subterminal, forming umbelliform fascicles; pedicels sessile; sepals ovate-oblong, pilose on outside; calycine glands usually 10, sometimes 6 or 7 or lacking; petals white or pink, the limb obovate-orbicular or rounded with the margin subentire or variously festooned, villose abaxially, the claw broad and villose; filaments briefly united and hirsutulous at the base; anthers ellipsoid to ovoid, glabrous, the thecae oblong with a narrow lateral wing externally, the connective thickened, enlarged at the apex and surpassing the thecae; ovary lanuginous to hirsute, tricoccoid, deeply sunken at the apex, trilocular, triovular; styles 3, affixed at the base of ovarian depression, subulate, glabrous; torus lanuginous. *Fruits* tricoccoid with the cocci subspherical, indehiscent, the pericarp thin, coriaceous and rigid.

Pterandra is a neotropical genus of 6 species, more than half of which occur in the Amazon basin (in the broadest sense) from Venezuela to Brazil. One species occurs on the Pacific slope of Colombia and another in the isthmus of Panama.

1. **Pterandra isthmica** Cuatr. & Croat.[15] TYPE: Panamá, *Mori & Kallunki 5007* (MO-2639883, holotype; K, MICH, PMA, US, VEN, isotypes).—FIG. 12.

Tree 4 m tall, the trunk to 10 cm d.b.h., the young branches yellowish-brown appressed-sericeous with trichomes contiguous, soon glabrate, the internodes 1.5–3.0 mm long near the apex. *Leaves* opposite, coriaceous, clustered at the ends of the branchlets, obovate-elliptic, obtuse to acute or acuminate at the apex, narrowly cuneate at the base, (3.5–)4.5–6.5 cm long, (1.1–)2.0–3.5 cm wide, entire, sparsely pilose to appressed-pubescent above with slender, somewhat flexuous T-shaped trichomes, becoming glabrate, the lower surface paler, subappressed-villous; primary lateral veins 6 or 7 on each side, gradually curved to the margins, the reticulate veins prominent, drying paler than the surface, the surface weakly viscidulous; petioles 6–10 mm long, subterete, appressed-pubescent, stipules 2–3 mm long, axillary, coalesced to petiole ca. ⅔ of their length, triangular, acute to narrowly rounded at the apex, densely subappressed villose. *Cymes* axillary to leaf scars, shorter than the leaves; flowers ca. 14 mm in diameter; pedicels 15–20 mm long, drying ca. 1 mm in diam., rigid, densely subappressed villous; bracts oblong-triangular, ca. 2 mm long, acute at the apex, villose outside, glabrous within; calyx 10 mm in diam., the sepals triangular or ovate, 4–5 mm long, 3.0–3.5 mm wide, subappressed-sericeous, the calycine glands thick, oblong-elliptic, 2–3 mm long, 1 mm in diam., well spaced or sometimes close; petals white, 7–8 mm long, 5.0–5.5 mm wide, the limb thick, obovate, rounded and entire at the apex, narrowed and weakly incised dentate below to lyrate, glabrous adaxially, villous along the midrib abaxially at least in the lower ⅓, the claw thick, ca. 1.5 mm long, barbate at the base, densely sericeous on the lower side; stamens 10, shorter than the sepals, the filaments thickened, flattened, 2.5–3.2 mm long, subulate towards the apex, shortly triangular-dilated at the base, the basal ¼ hirsute-barbate, the trichomes to 1 mm long; anthers ellipsoid, ca. 1.5 mm long, the connective thickened, protruded apically, the lateral wings of the thecae papillate, 0.3 mm wide. *Fruits* tricoccoid, 3-lobed, the cocci monospermous, indehiscent, subglobose, cartilaginous, rounded on the outside, obtusely triangular on inside, 3.5 mm in diam., densely reddish brown-hirsute, the scar ca. 2 mm in diam., the styles free, subulate, affixed adaxially to the base of the carpel; seed globose, the integument membranaceous; cotyledons contorted, convolutely spiraled inward, torus flat, hirsute.

Pterandra isthmica is known from the type collection in a region of premontane rain forest. The type collection had immature but probably mature-sized fruits in early March. The species is not confused with any other in Panama and

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[15] *Pterandra isthmica* Cuatr. & Croat, spec. nov. Arbor, circa 4 m, ramis hornotinis fulvis adpresse sericeis. Folia ad terminationem ramulorum fasciculata, opposita coriacea; lamina obovato-elliptica apice attenuata subacutata vel breviter apiculata basim angustata cuneataque, margine integerrima, 4.5–6.5 × 2.3–3.3 cm; petiolus 6–10 mm longus. Flores circa 14 mm diam., longe pedicellati in cymis axillaribus cicatrichium foliorum delapsorum. Pedicelli 15–20 mm longi. Calyx 10 mm diam. Sepala triangularia vel ovata 4–5 mm longa 3.0–3.5 mm lata. Petala 8 × 5–5.5 mm, lamina crassiuscula, obovata, apice rotundata, integra sed deorsum angustata plus minusve dentato incisa ad modum lyrata ungue crasso circa 1.5 mm longo, basi barbato, abaxiale sicut costa dense sericea. Fructus in 3 coccis indehiscentibus subglobosis monospermis, 3.5 mm diam. Styli 3 liberi subulati, 5 mm longi, ad basim carpellarum adaxialiter affixi. Semen pisiforme integumento membranaceo.

is recognized by its arborescent habit, by its almost fascicled, coriaceous leaves with prominent reticulate venation, and its tricoccoid fruits.

This is the first report of the genus *Pterandra* for Central America. *Pterandra isthmica* most closely resembles *P. sericea* Anderson and *P. flavescens* Maguire from the Guiana Highlands. *Pterandra flavescens* is readily differentiated by its elliptical, obtuse leaves, which are whitish beneath with a short and diluted indument of minute appressed trichomes. *Pterandra sericea* is more similar to the new species because of its villous-sericeous indument, but *P. isthmica* differs in the more obovate shape of the leaf blades which are always cuneate at the base and by the reticulate venation which is pale and conspicuous on the upper surface and prominent on the lower surface as well as the villous indument which is also dense but looser in *P. isthmica*. The nearest species geographically is *P. ultramontana* Riley from Gorgona Island, Colombia, but it differs from the Panamanian species by its larger, thinner leaves, by its short, scattered, appressed pubescence, and by the inflorescence which consists of a cluster of flowers appearing on young terminal shoots above the level of the leafy nodes. Furthermore, *P. ultramontana* has the stipules united only at the base and has longer, thinner, weaker pedicels.

PANAMÁ: NE of town of Cerro Azul, 20 km by road from Inter-American Highway, *Mori & Kallunki 5007* (K, MICH, MO, PMA, US, VEN).

12. SPACHEA

Spachea Juss. in Deless., Icon. Sel. Pl. 3: 19. 1837. TYPE: *Spachea elegans* (G. F. W. Meyer) Juss.

Trees or *shrubs*. *Leaves* opposite, coriaceous, subcoriaceous, or membranaceous, glandular at the base; stipules connate, intra-axillary. *Inflorescences* terminal, spiciform in elongated panicles with short branches or solitary in pseudoracemes; bracts small, eglandular; bracteoles with a dorsal gland, a stalked axillary gland or eglandular. *Flowers* with the calyx 8–10 glandular; sepals ovate or elliptic, glabrous or puberulous; petals pink or reddish, clawed, glabrous, the limb suborbicular, obovate or elliptic; claw broadening toward the base; stamens 10, the filaments flattened, short and briefly united at the base, pubescent at the base, otherwise glabrous, the anthers ovoid or oblong, glabrous, the connective not thickened; ovary 3- or 2-carpellate, 3- or 2-locular, 3- or 2-lobate, 3- or 2-ovulate; styles 1 per locule, flexuous, with the apex somewhat thickened and truncate. *Fruit* a coriaceous schizocarp of 2 or 3 separable, ellipsoid cocci, each coccus 1-seeded, hard, smooth; cotyledons thick, semiellipsoid.

Spachea is a genus of about 10 species, chiefly South American, but with a few species in the West Indies and in southern Central America.

a. Peduncles biflorous with pedicellate axillary bracteole glands; leaves often to 8.5 cm wide, coriaceous, broadly elliptic to elliptic, round at base ..... 1. *S. correae*

aa. Peduncles uniflorous, with or without axillary bracteole glands; leaves usually less than 8.5 cm wide, usually thin, various in shape but usually not elliptic, usually acute to attenuate at base.

b. Peduncles bearing stalked glands associated with the bracteoles, the pedicels relatively short, the rachis and peduncles ferruginous-pubescent; leaves chartaceous or

subcoriaceous, acute to attenuate at the base; occurring in tropical wet or premontane wet forest at elevations up to 700 m ..... 2. *S. elegans*

bb. Peduncles without glands, the pedicels long, slender, the rachis moderately or scarcely pubescent; leaves membranaceous, rounded at base; occurring in tropical moist forest at low elevations ..... 3. *S. membranacea*

1. **Spachea correae** Cuatr. & Croat.[16] TYPE: Panama, *Correa & Dressler 696* (MO-2053816, holotype).

Trees, ca. 16 m tall, thinly white sericeous when young, soon glabrate. *Leaves* opposite, subcoriaceous, mostly clustered near the ends of the branches, elliptic, abruptly and obtusely acuminate at the apex, rounded to attenuate at the base, 15–21 cm long, 4.5–10.5 cm wide, drying reddish-brown, glabrous or nearly so above, the midrib sunken, glabrous below except sparsely appressed-pubescent on the midrib, with a few oval or less frequently rounded, sunken, dark, opaque glands scattered over the surface but especially in the lower ½ of the blade along the margin and near the midrib; primary lateral veins 9–11 pairs, moderately straight to the middle, then curved upward and loosely connected, the tertiary veins prominulous, the margins strongly revolute; petioles densely appressed-pubescent, 1.5–2.5 cm long; stipules lanceolate, ca. 6 mm long, bilobed at the apex, clasping the petiole at the base, fused to the petiole and remaining with it when the leaves fall, densely appressed-pubescent outside, glabrous within. *Inflorescences* terminal at the ends of short branches on the older stems, ca. 20 cm long; axes and peduncles densely ferruginous, appressed-pubescent with T-shaped trichomes; peduncles shortly branched, ferruginous-tomentose, each bearing 2 flowers; bracts narrowly ovate, acute to acuminate, 1.5–2.0 mm long, weakly clasping at the base, pubescent outside, glabrous inside, ciliate; pedicels 4–6 mm long, appressed pubescent; bracteoles alternate, minute, narrowly ovate, with stalked axillary glands 1–2 mm long, the stalk flattened, pubescent, the gland disc shaped, 1.0–1.5 mm diam. *Flowers* with the sepals 3.5–6.0 mm long (in fruit), ovate-oblong, rounded at the apex, verrucose and pubescent outside, glabrous and smooth within, glandular, the glands 10, oblong, ca. 2 mm long, the apical portion somewhat narrower, turned weakly outward; petals not seen; stamens persisting with fruits ca. 2 mm long, somewhat flattened, pubescent at the base, the anthers ovate-oblong, 0.7 mm long; ovary bicarpellate, bilocular, the styles 2. *Fruits* bicoccoid, bilobed, the cocci ellipsoid, ca. 5 mm long (dried), blackish on drying, shiny, joined to each other for only about ⅔ of their width on the inner side.

Spachea correae is known from tropical wet forest in Colón Province at elevations of 100–400 meters. It is distinguished by its large, thick leaves with revolute margins and its inflorescences with 2-flowered peduncles and stalked

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[16] *Spachea correae* Cuatr. & Croat, spec. nov. Folia opposita subcoriacea firmula, basi obtusa vel obtuse cuneata, apice obtusa apiculata, glabra vel subglabra, 15–21 × 4.5–10.5 cm. Inflorescentiae terminales, axe dense ferrugineo-substrigoso, pedunculis 2-floris, bracteola suprema in axilla glandula discoidali pediculata instructa, pedicellis 4–6 mm longis sursum incrassatis adpresse pubescentibus, sepalis 3.5–6 mm ovato-oblongis obtusis abaxiale pubescentibus, glandulis 10, staminum filamentis complanatis basi pilosis antheris ovato-oblongis 0.7 mm, ovario biloculari, fructibus didymis coccis ellipsoideis in sicco 5 mm longis.

glandular bracteoles. The species is named in honor of Mireya D. Correa A., a notable Panamanian botanist.

COLÓN: Santa Rita Ridge Lumber Road, *Correa & Dressler 696* (MO). Río Rita NE of Colón, 100 m, *Holdridge 6244* (MO, PMA).

2. **Spachea elegans** (G. F. W. Meyer) Juss. in Deless., Icon. Sel. Pl. 3: 19. *tab. 31*. 1837.

Malpighia elegans G. F. W. Meyer, Prim. Fl. Esseq. 178. 1818. TYPE: Guyana, *Meyer* (?GOET, not seen).
Byrsonima elegans (G. F. W. Meyer) DC., Prodr. 1: 580. 1824.

Trees, to 16 m tall and 12 cm d.b.h.; stems densely ferruginous-sericeous or ferruginous-tomentose when young, soon glabrous, the leaf scars conspicuous. *Leaves* opposite, thin, elliptic to oblong-elliptic, mostly rounded and abruptly acuminate at the apex, sometimes gradually acuminate, attenuate at the base, 9.0–14.5 cm long, 3.0–8.5 cm wide, glabrous above except for a few scattered trichomes on the midrib and the surface, drying shiny above, glabrous and shiny below except relatively densely appressed-pubescent on the midrib, the midrib drying almost flat above, raised beneath; primary lateral veins 7–9 pairs, directed almost straight toward the margins, becoming ramified and loop-connected before the margin, beneath drying scarcely more conspicuous than the prominulous tertiary veins, the margins often weakly revolute; petioles 1.5–2.0 cm long, densely pubescent like the stems, eglandular. *Inflorescences* spiciform, axillary, pendent, the axis stout, to more than 30 cm long, the branches short, ca. 1 cm long, the axes, branches, and peduncles densely ferruginous-tomentose; bracts small, ovate, eglandular; peduncles 3–4 mm long; pedicels 5–8 mm long; bracteoles minute with a stalked axillary gland, the gland ca. 1 mm long, the stalk flattened but thickened medially, sparsely pubescent, the gland discoid, ca. 5 mm wide. *Flowers* to 1.5 cm diam.; sepals glandular, oblong-ellipsoid, rounded at the apex, sparsely pubescent, the glands 8 or 9, oblong or oval, 2.5–4.0 mm long; petals pink, clawed, orbicular or obovate, 3–4 mm long, the claw 2.0–3.5 mm long; stamens 10, the filaments connate basally. *Fruits* not seen.

Spachea elegans is a widespread, variable species known from Panama, the West Indies, the Guianas, Trinidad, and the Amazon basin. Few collections were available for study. In Panama the species is known from tropical wet forest or premontane wet forest at ca. 700 meters elevation.

Perhaps noteworthy for recognition as a subspecies of *Spachea elegans* is *Duke & Kirkbride 14065* from the Río Paya in Darién Province. This collection has leaves which look like *S. membranacea* but have the stalked bracteole glands and branched peduncles of *S. elegans*. The plant is perhaps of hybrid origin.

PANAMÁ: Cerro Jefe, 2100–2200 ft, *Duke 15209* (MICH, MO, PMA, RSA, US).

3. **Spachea membranacea** Cuatr., Webbia 13: 548–549. 1958. TYPE: Río Carepa, Quebrada Entre-Dos, 12 km NE of Chigorodó, 35 km S of Turbo, 100 m, Antioquia, Colombia, *Haught 4732* (US, holotype).—FIG. 13.

Slender *trees*, to 10 m tall; sap often somewhat milky; young stems, petioles,

FIGURE 12. *Pterandra isthmica* Cuatr. & Croat.—A. Branch with flowers and fruits (×3/6).—B. Open flower with developing fruit (×2½). [After *Mori & Kallunki 5007* (MO).]

inflorescence branches, and midrib of leaf strigose with ferruginous, T-shaped trichomes. *Leaves* opposite, ovate-elliptic to oblanceolate, long-acuminate, rounded or shortly cuneate at the base, 4–18 cm long, 1.5–6.0 cm wide, glabrate except for the midrib above and below, with several round glands below, usually 1 on each side of the midrib below and others sometimes scattered throughout the blade, the margin entire, pubescent, revolute in age; petioles 6–9 mm long; stipules connate, minute, ovate, axillary. *Inflorescences* of long, pendent, axillary racemes 10–20 cm long, longer than the leaves, the axes and peduncles sparsely

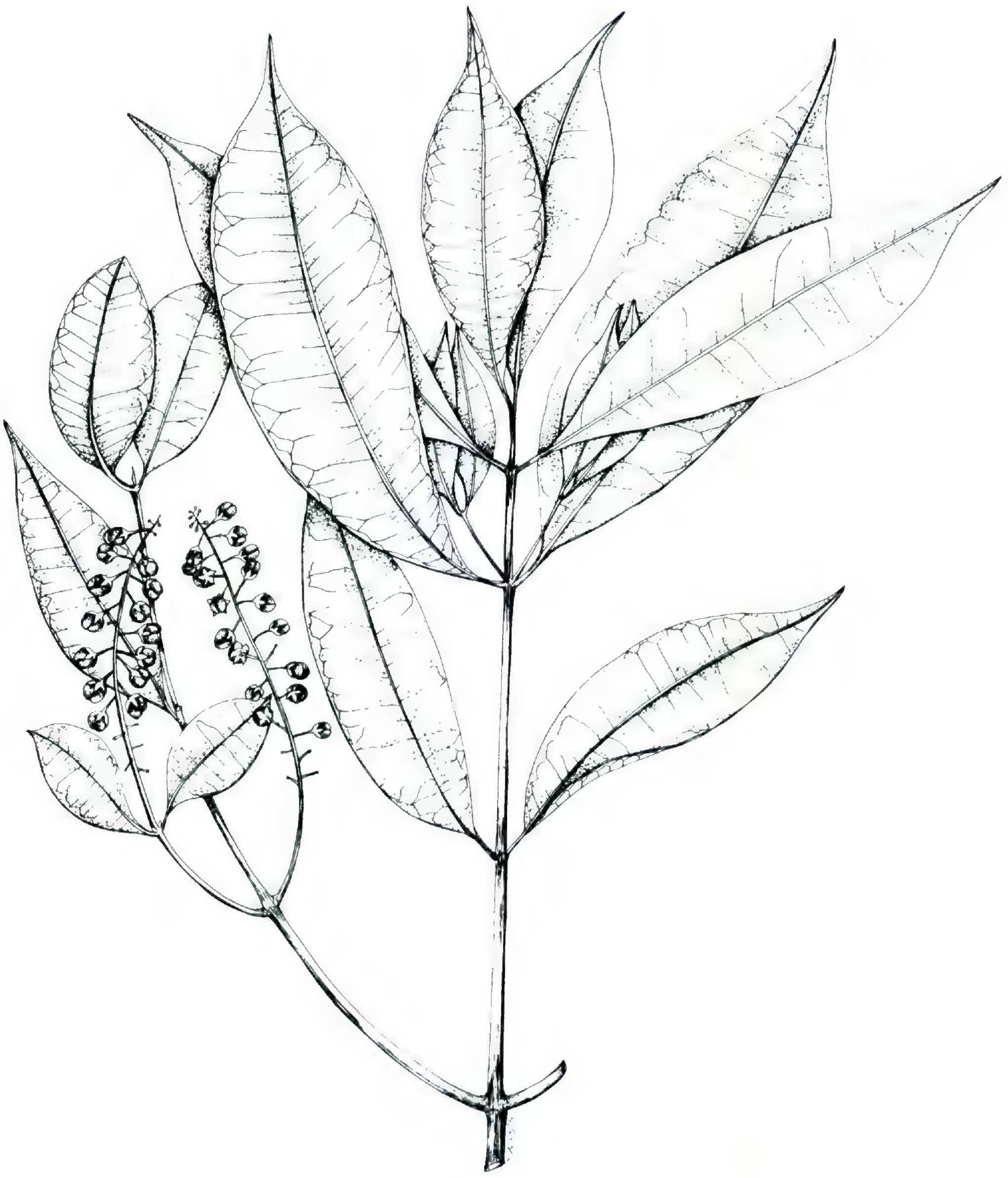

FIGURE 13. *Spachea membranacea* Cuatr. Fruiting branch (×½). [After *Croat 15150* (MO).]

ferruginous-pubescent with appressed, T-shaped trichomes; axis slender, flexuous; bracts ovate-oblong, acute, ca. 1.5 mm long, united to the peduncle at the base; pedicel 1-flowered, 2–5 mm long, bearing 2 small bracts midway and 5 inconspicuous glandular appendages at the apex; peduncle 5–10 mm long, pink. *Flowers* 8 mm diam.; calyx 8-glandular, the sepals oblong-elliptic, ca. 2.5 mm long, thickened toward the apex, puberulent or glabrescent, acute to rounded and reflexed at the apex, ciliate, the glands white, prominent, 2.5–3.0 mm long, narrowed and curved outward at the apex; petals clawed, magenta, obovate, ca. 4

mm long, ciliate, spreading, the base attenuate, the margins weakly denticulate, the claw thick, 1.0–1.5 mm long; stamens 10, ca. 2 mm long, shorter than the sepals, subequal, the anthers elliptic-oblong, glabrous, ca. 1 mm long, the filaments ca. 1 mm long, hirsute at the base; pistil 2-parted, each ovary with a slender, persistent, divergent style, longer than the ovary, the apex truncate, thickened, held at about the level of the anther. *Fruit* a coriaceous schizocarp of 2 separable, 1-seeded carpels, each carpel indehiscent, ovoid, 3.5–5.0 mm long and ca. 2 mm wide, with a thin fleshy red covering at maturity; seeds hemispheroid, tan, smooth, ca. 4 mm long.

Spachea membranacea is known from Colombia and Panama. In Panama the species occurs in tropical moist forest at less than 500 meters elevation. It is perhaps closest to *S. herbert-smithii* (Rusby) Cuatr. from Colombia, but that species has a prominent stalked gland on each 1-flowered peduncle.

CANAL ZONE: Upper Chilibre River, 1 mi below Chilibre, *Seibert 1511* (MO, US). BARRO COLORADO ISLAND: *Aviles 12* (F, MO), *1007* (F); *Bangham 579* (A, F); *Croat 4748* (MO, NY, SCZ), *4756, 4769, 4778* (all MO, SCZ), *6397* (GH, MO, SCZ), *8123, 8470* (both MO), *15150* (DUKE, GH, MO, NY, SCZ), *14625* (MO), *14862* (DUKE, F, MO, NY, PMA, SCZ), *14920* (F, MO, SCZ), *16632* (DUKE, GH, MO, NY); *Ebinger 172* (MO, US); *Foster 873, 1055, 1078* (all DUKE, F, GH, MO, PMA), *1342* (DUKE); *Knight 4035* (MO); *Salvoza 1000* (A); *Shattuck 1007* (MO); *Webster & Breckon 16441* (DUKE, MO). DARIÉN: Río Perecenico, *Duke 8221* (MO, OS). Quebrada Maskia off Río Pucro above Pucro, *Duke 13092* (MO, OS, US). El Real, Río Tuira, *Stern et al. 767* (MO). Campamente Buenevista, Río Chucunaque above confluence with Río Tucesa, *Stern et al. 922* (MO). PANAMÁ: Between Río Maje and Quebrada Brava, 60 m, *Croat 34607* (MO). Río Maje, ca. 4–5 mi above waterfalls near Bayano Lake, 100 m, *Croat 34694* (DUKE, MO, NY, RSA, US). Río Potrero, ca. 2 mi from Arrajan, *Duke 4683* (G, MO, NY). Between Cañasas and Sabola, ca. 100 m, *Duke 14459* (MO, OS, US). Bayano, Ciupo forest, Río Piarti, *Folsom 3543* (MO). SAN BLAS: Hydro Camp Cuadi on Río Cuadi, *Duke 15460* (US).

13. STIGMAPHYLLON

Stigmaphyllon Juss. in St.-Hilaire, Fl. Bras. Mer. 3: 48. *tab. 171.* 1832. TYPE: *Banisteria auriculata* Cav. ≡ *Stigmaphyllon auriculatum* (Cav.) Juss.

Brachypterys Juss. in Deless., Icon. Sel. Pl. 3: 20. 1837. TYPE: *B. australis* Juss., nom. illeg. = *Stigmaphyllon paralias* Juss.

Lianas, vines or rarely *shrubs,* frequently becoming canopy lianas. *Leaves* opposite or subopposite, rarely alternate, simple, entire, petiolate, membranaceous or coriaceous, with glands at the base of the blade or at the apex of the petiole; stipules small and caducous or absent. *Inflorescences* of umbelliform corymbs, umbels or pseudo-umbels, arranged in dichotomous cymes. *Flowers* pedicellate with pedunculate pedicels, the central cluster of flowers frequently sessile, the lateral clusters pedunculate; bracts and bracteoles conspicuous; sepals 5, membranaceous or thick, ovate or oblong, with 4 pairs of glands; petals unguiculate, yellow, sometimes marked with orange or red at the center, the limb orbicular or elliptic, often more or less concave, the margin denticulate or fimbriate, the interior petal often smaller; stamens 10, unequal, the filaments glabrous, flattened, united briefly at the base, the anthers unequal, the 4 opposite the lateral sepals generally reduced and practically sterile, the remaining 6 well developed, the 3 opposite the pistil larger; ovary trilocular, trilobate, the styles 3, free, erect or curved, somewhat flattened, dilated at apex, spathulate-truncate

with the inner angle obtuse and stigmatic, the outer angle acute or apiculate in the medial style, the medial style bilaterally, and symmetrically winged or appendiculate, in the lateral styles unilaterally winged, the appendages foliaceous and pendulous or only enlarged horizontally into a pediform projection. *Fruit* a schizocarp of three samaras, the seminiferous area rounded or ovoid, smooth, verrucose, tuberculate or with crestlike appendages; the dorsal wing membranaceous or subcoriaceous with the ventral margin thickened and smooth, the dorsal margin thin, frequently crenulate; rarely with the wing reduced to a crest (section *Brachypterys*).

Stigmaphyllon is a neotropical genus with about 80 species of climbers and lianas scattered throughout the area; they are found in rain forests and in savannas as well as among thickets and scrubby secondary vegetation, usually from sea level to 2,000 m (2,800 m) elevation. See Adams (1972: 400).

a. Fruit almost wingless, the body with about 3 lateral tuberculate ribs, the dorsal wing reduced to a short, obtusely triangular, terminal crest; styles shortly horizontally dilated, pediform at the apex ---------- 5. *S. ovatum*
aa. Fruit with a long, membranaceous or papyraceous, well developed, dorsal wing; styles with a foliaceous appendix or pediform at apex.
  b. Adult leaves glabrous or glabrate with minute scattered appressed trichomes; branchlets glabrous ---------- 1. *S. ellipticum*
  bb. Adult leaves copiously pubescent; branchlets pubescent or strigose.
    c. Leaf blades elliptic or ovate-elliptic, acute, obtuse or subrounded at base, pinnately veined throughout.
      d. Leaf blades subcoriaceous or coriaceous, with lower surface sericeous, shiny, whitish to brown, the trichomes contiguous with each other along much of their length; wing of samara narrowest at base, membranaceous, mostly 2.5–3.9 cm long; the dorsal margin convex; ventral margin straight or curved ---------- 3. *S. hypargyreum*
      dd. Leaf blades membranaceous, adaxially prominently reticulate, abaxially diluted, appressed puberulous, the principal veins sericeous; wing of the samara broadest at base, subcoriaceous, mostly less than 2 cm long, the dorsal margin concave, the ventral margin straight ---------- 6. *S. puberum*
    cc. Leaf blades broadly ovate, or elliptic-ovate, cordate or subcordate at base, at least emarginate, usually palmiveined at the base, at least the lowermost pair of veins on each side of the midrib joining before meeting the midrib.
      e. Indumentum of lower blade surface wooly, the trichomes mostly patulous, flexuose or crisped, 1–2 mm long ---------- 2. *S. humboldtianum*
      ee. Indumentum of lower blade surface diluted sericeous, the trichomes minute, to 0.8(–1) mm, mostly closely appressed ---------- 4. *S. lindenianum*

1. **Stigmaphyllon ellipticum** (H.B.K.) Juss., Malpigh. Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 290. 1840. Monogr. Malpigh. 123. 1843.

Banisteria elliptica H.B.K., Nov. Gen. Sp. Pl. 5: 161. 1822. TYPE: Ecuador, circa Loja, *Humboldt & Bonpland* (P; F, photo FM-33401).
B. mucronata DC., Prodr. 1: 589. 1824. TYPE: Mexico, Herb. DC. (G, seen; F, photo FM 33401).
Stigmaphyllon mucronatum (DC.) Juss., Monogr. Malpigh. 123. 1843. TYPE: Mexico, Vera Cruz, ad Bonsoquitla et Zacuapan, 2000 ft elev., *Linden* (Pl. exc. 907, not seen).
Banisteria billbergiana Beurl., Bidr. Portobellos Fl., Svensk Vet. Handl. 1854. 118. 1854. TYPE: Panama: Colón: Portobelo, *Billberg 285* (not seen).

Liana; essentially glabrous to sparsely appressed-pubescent especially on younger parts (trichomes type A); stems reddish brown. *Leaves* opposite, ovate-elliptic to oblong-ovate, usually abruptly acuminate and often down-turned at apex, obtuse to rounded or subcordate at base, 6–13 cm long, 2.5–6.5 cm wide,

often glaucous beneath, lateral veins 9–11 pairs, reticulate venation prominulous on both the surfaces, the margin entire; petioles 1–3 cm long, with a pair of round apical glands. *Inflorescences* of umbelliform, 4- or 5-flowered corymbs, axillary or terminal; peduncles appressed-pubescent, 12–35 mm long, bibracteate. *Flowers* to 2.5 cm wide; pedicels mostly 1–1.5(2) cm long, glabrate; sepals rounded at the apex, sparsely pubescent and ciliate, all but 1 bearing 2 conspicuous glands; glands oblong-subrounded, to 2 mm long, glabrous; petals 12–14 mm long, glabrous, yellow, rounded but clawed at the base, the margins fimbriate; petals on either side of glandless sepal slightly to prominently cupular and usually fitted together after anthesis (cupped over the fertile parts); stamens 10, unequal, 6 long, equalling style, 3 of these situated beneath or adjacent to stigmas, producing much pollen, 3 long stamens sterile or producing little pollen, 2 short fertile stamens on either side of glandless sepal, the other 2 short stamens on the opposite side of the flower, the anthers with connective produced above, whitish, globular, fleshy; pollen tan, sticking together loosely; stigmas 3, green, the one opposite the glandless sepal symmetrical, spathulate, with an active gland near the apex, the other 2 stigmas adjacent, broadly expanded, with a slit on the inner side, this oozing pollen from the anther below. *Fruit* usually of 3 samaras fused at base, reddish at maturity, especially the outer margin and apex, pubescent especially at the body; the dorsal wing 2–3 cm long, ca. 1 cm wide, with a small crest or lobe on inner margin above the body and with reduced lateral wings which are variously lobed or sometimes divided into 2–4 narrow appendages.

The species is the most common *Stigmaphyllon* in Panama and is ecologically variable, occurring principally in disturbed areas. It is most commonly found in regions of tropical moist forest but occurs in tropical dry forest, premontane moist forest, premontane wet forest and tropical wet forest areas as well. The species flowers and fruits throughout the year.

Stigmaphyllon ellipticum ranges from Mexico to the West Indies, Colombia and Ecuador.

BOCAS DEL TORO: Isla Colón, *Wedel 82* (GH, MO). Water Valley, *Wedel 891* (GH, MO, US), *995A* (MO), *1618* (GH, MO, US). Chiriquí Lagoon, *Wedel 1176, 1300, 2654* (all GH, MO, US). Water Valley, *Wedel 1794* (GH, MO). Isla Colón, *Wedel 2828* (GH, MO, NY). Without other locality, *Wedel 2944* (GH, MO, NY, US). CANAL ZONE: Fort Kobbe, *Allen 2015* (MO). Juan Mina, *Bartlett & Lasser 16772* (MO). Fort San Lorenzo, *Burch et al. 1046* (GH, K, MO, UC, US). Pipeline Road at end near Gatún Lake, *Croat 4704* (MO), *4707* (F, NY, SCZ). Gaillard Highway near Gamboa, *Croat 11169* (F, MO, SCZ). Pipeline Road to 18 km N of Gamboa, *D'Arcy 10634* (MO). Near Salamanca Hydrographic Station on the gorge of Río Pequiní, 70–80 m, *Dodge et al. 16966* (MO). Quebrada entering lake at 70 m, Río Indio 70–80 m, *Dodge & Allen 17289* (MO). Beach near Ft. Kobbe, *Duke 4240* (MO, US). Hill C6, Fort Sherman, *Duke 4361* (MO, US). Farfan Beach, *Dwyer 4002* (MO). Pipeline Road 1 mi N of Gamboa, *Gentry 3391* (MO). Beach near Ft. Kobbe, *Gentry 6433* (MO). Curundu, *Harvey 5188* (F). Without locality, *Johansen 22* (US). San José Island, *Johnston 352* (MO), *793* (GH). Gamboa near edge of canal, *Kennedy & Steiner 2462* (MO, US). Ancón Hill, *Killip 3012* (US). Chiva Chiva Trail, Red Tank to Pueblo Nuevo, *Piper 1727* (US). Ancón Hill, *Standley 2638* (US). Summit, *Standley 26934* (US). Gamboa, *Standley 28355* (US). Las Cascadas Plantation near Summit, *Standley 29599* (US). Fort Sherman, *Standley 31218* (US). Drowned forest of Quebrada Ancha, 70 m, *Steyermark & Allen* 12/21/34 (MO). Madden Forest, 100 m, *Sullivan 260* (MO). Old Fort San Lorenzo, *Tyson 1585* (SCZ), *2228* (MO). 1–2 mi N of Cocolí, *Tyson 1642* (MO), *1643* (SCZ). Farfan Beach area, *Tyson & Blum 2616* (MO, SCZ). Road to FAA radar tower, 1 mi N of Summit Gardens, *Tyson et al. 2757* (SCZ). Miraflores, *White & White 55* (MO). Salamanca Hydrographic Station, Río Pequiní, 80 m, *Woodson et al. 1557* (A, MO, NY, US). BARRO COLORADO ISLAND: Aviles *111, 960* (both F, MO); *Bangham 439, 619* (both A); *Croat 4850* (MO, SCZ), *6090* (F, MO), *6238, 6357* (both

MO), *6438* (MO, SCZ), *7233, 7420* (both MO), *7901* (F, MO, SCZ); *Dwyer et al. 8433* (MO); *Foster 1320* (DUKE, F, GH, PMA), *1619* (PMA); *Hunnewell 19017* (GH); *Kenoyer 402* (US); *Maxon 11* (US); *Salvosa 791* (A); *Shattuck 474* (F, MO, US), *742, 960* (both MO); *Starry 237* (F); *Wilson 129* (F, MO); *Woodworth & Vestal 411* (F), *412* (A, F, MO), *469* (A, MO), *727* (A, F). CHIRIQUÍ: Burica Peninsula, 1 mi W of airport at Puerto Armuelles, *Croat 21910* (MO). Burica Peninsula, vicinity of San Bartolo Limite, 300–500 m, *Croat 21989* (MO). Burica Peninsula, Quebrada Guanabano, 0–100 m, *Croat 22501* (MO, US). Above San Félix along mining road 18–27 mi from Panamerican Highway, 1200–1500 m, *Croat 33077* (MO). Volcán District, near Las Lagunas, *D'Arcy 10054* (MO). Boquete, *Davidson 605* (A, MO, US). Along road between Boquete and Cerro Horqueta, *Duke 13710* (DUKE, MO, SCZ). Cerro Colorado, 8.5 km from Escopta, 800–1000 m, *Folsom 4926* (MO). Boquete, 3300–4200 ft, *Lewis et al. 389* (GH, MO, US). N of San Felix, 33.4 km by road from Interamerican Highway, *Mori & Kallunki 6024* (MICH, MO, PMA, US). 17 km NE of San Felix on new road to Cerro Colorado copper mines, 1000 m, *Nee 10736* (MO, PMA, US), *10750* (MO, PMA). Forests around Boquete, *Pittier 2951* (US). Banks leading to Bajo Quiel, 4 mi NW of Boquete, 1350 m, *Wilbur et al. 15520* (DUKE, MO). Finca Lérida to Boquete, 1300–1700 m, *Woodson et al. 1107* (A, MO, US). COCLÉ: S rim of El Valle, 600–1000 m, *Allen 1777* (MO). Penonomé, 500–1000 ft, *Williams 239, 358* (both NY). COLÓN: Río Gatuncillo, vicinity of Santa Rosa, *Allen 4165* (MO). Garotte, ca. 10 km NE of Portobelo, sea level, *D'Arcy 4000B* (MO). Coastline between Garotte and La Guaira, *D'Arcy 9376* (MO). Mari Chiquita, *Ebinger 434* (F, GH, MO). W of Piña along coast, *Gentry 8624* (MO, PMA). Road to Fort San Lorenzo, *Quistgaard 57* (PMA). DARIÉN: Río Ucurganti, *Duke 1172* (OS). 5 mi downstream from El Real, *Duke 4910* (GH, MO, US). Pinas, *Duke 10636* (OS). Jaqué, *Duke 10662* (MO). Puerto St. Dorothea, *Dwyer 2235* (MO, PMA). Río Chucunaque, 0–1 hour above Yaviza, sea level, *Gentry 13478* (MO, PMA). Río Turia below El Real and Piriaque Islands, *Stern et al. 886* (MO, NY). HERRERA: Road between Las Minas and Pesé, 600 ft, *Duke 12311* (MO, OS, US). Above Chepo de las Minas, 700 m, *Folsom & Channel 7005* (MO). 12 mi S of Ocú on Las Minas Road, *Graham 32* (GH). 72.5 m S of Ocú, 1200 ft, *Lewis et al. 1621, 1685* (both MO, US). Ocú, *Stern et al. 1741* (MO, US). LOS SANTOS: Los Foretos, *Dwyer 2438* (MO). PANAMÁ: Campana Hill, 600–800 m, *Allen 2448* (US). Bejuco, 25 ft, *Allen 4514* (MO). Cerro Campana, *Bartlett & Lasser 19620* (MO). On road to Cerro Campana, *Croat 12033* (MO, SCZ). Road between Cerro Jefe and La Eneida, *Croat 13097* (F, MO). Cerro Campana, *D'Arcy 9593* (MO). Cerro Jefe, *D'Arcy 9733* (MO). Panama Viejo, *Duke 5712* (MO). Bald savanna areas, top of Cerro Campana, *Duke 5976, 6021* (MO). Taboga Island, *Dwyer 2827* (MO). Goofy Lake to 8 mi S on road to Cerro Jefe, *Dwyer 7076* (GH, MO, US). San José Island, *Erlanson 36* (GH, NY, US), *520* (GH, US). N of El Llano, 500–800 m, *Gentry 5561* (MO, PMA). Manzanilla Island, *Hayes 30* (GH), *697* (NY). Río Tocumen, N of Chepo Road, to 30 m, *Hunter & Allen 231* (MO). San José Island, *Johnston 352* (MO), *793* (GH). 2–3 mi S of Goofy Lake on road to Cerro Jefe, 2000–2300 ft, *Lewis et al. 238* (MO). Taboga Island, *Pittier 2579* (US). Hills between Río Grande and Pedro Vidal on road to Arraiján, 50–150 m, *Pittier 2703* (US). Cerro Campana, *Porter et al. 4297* (MO). Playon-Chico and vicinity, *Stier 40* (MO). 1 mi E of El Llano on limestone outcrop, *Tyson 6878* (MO, PMA). Road between Cermeño and Monte Oscuro, *Varela 17* (PMA). SAN BLAS: Mulatupo, *Duke 8551* (DUKE, GH). Isla Soskatupu, *Duke 8935, 8939* (both MO). Ailigandí, *Dwyer 6858* (MO). Isla Soskatupu, *Elias 1661* (GH, MO, US). Mainland opposite Achituppu, to 1.5 mi inland, *Lewis et al. 86* (MO). Puerto Obaldía, 0–50 m, *Pittier 4363* (US). VERAGUAS: Last major stream between Santa Fé and Escuela Agrícola Alto Piedra, 420 m, *Croat & Folsom 33836* (CAS, MO, TEX). Isla de Coiba, *Dwyer 1602A* (MO), *2362* (GH, MO); *Foster 1645* (DUKE, MO, PMA).

2. **Stigmaphyllon humboldtianum** (DC.) Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 288. 1840.

Banisteria tiliaefolia H.B.K., Nov. Gen. Sp. Pl. 5: 162. 1822. TYPE: Colombia, between Cartagena and Cerro de la Popa, *Humboldt & Bonpland 1377* (P, isotype). Nom. illeg. non *B. tiliaefolia* Ventenat, Choix Pl. 50. *tab. 50.* 1803.

B. humboldtiana DC., Prodr. 1: 588. 1824. TYPE: *Humboldt & Bonpland 1377* (P, not seen).

B. variifolia DC., Prodr. 1: 588. 1824. TYPE: Colombia, Santa Marta, *Bertero* (G, not seen; F, photo).

Stigmaphyllon tiliaefolium Niedenzu, Ind. Lect. Lyc. Brunsb. 1900(2): 16. 1900; Malpigh. (Pflanzenp. 141(93):) 496. *Fig. 36 E.* 1928.

S. tiliaefolium var. *diversifolium* Niedenzu. TYPE: Santa Marta, Colombia, *Bertero s.n.* (G, not seen; F, photo FM 8017).

S. lupulus S. Wats., Proc. Amer. Acad. Arts 21: 461. 1885. TYPE: Mexico, Tamasopo, *Pringle 4102* (US).

S. lindenianum var. *lupulus* (S. Wats.) Niedenzu, Ind. Lect. Lyc. Brunsb. 1900(2): 19. 1900.

S. lindenianum ssp. *lupulus* var. *watsonianum* Niedenzu, Malpigh. (Pflanzenr. 141(93:) 499. 1928. LECTOTYPE: Mexico, San Luis Potosí, mountains of Tamasopo, *Pringle 4102* (MO).
S. lindenianum var. *yucatanum* Niedenzu, Ind. Lect. Lyc. Brunsb. 1900(2): 18. 1900. 1928. TYPE: Mexico, Yucatan, *Gaumer 408* (US).

Liana, younger stems densely appressed-pubescent, the trichomes T-shaped, mostly type A, in part type B, with free ends straight but somewhat patulous, becoming glabrous in age. *Leaves* opposite or subopposite, ovate to suborbicular, abruptly to gradually acuminate at apex, also often apiculate, rounded to cordate at base, 4–13 cm long, 3–10 cm wide, palmiveined at base with the lowermost lateral veins usually joining before reaching the midrib, with 3 or 4 pairs of lateral veins above the base, these arcuate-ascending, drying dark, the upper surface nearly glabrous, the reticulate venation obscure, the lower surface densely lanuginous with 2 types of T-shaped trichomes, both sessile and stalked (type A and type B), the free ends curved and twisted mostly patulous; margins entire with a few, widely spaced, conspicuous glands; petioles 2–6(10) cm long, moderately appressed-pubescent, flexuose, biglandular at apex. *Inflorescence* terminal or axillary, of branched 10–15-flowered umbels; branches, peduncles, pedicels and calyces densely appressed-pubescent; peduncles 2–7 mm long, bibracteate at the apex; pedicels 5–8 mm long. *Flowers* to ca. 2 cm diam.; sepals ovate, obtuse, ca. 2 mm long, nearly glabrous along the outside margin, the glands swollen, oblong-elliptic, to 1.6 mm long at anthesis; petals yellow, broadly obovate, clawed, 8–12 mm long, often unequal, glabrous, the margins denticulate; stamens glabrous, unequal, 2.5–3.5 mm long, the filaments flattened toward the base, united near the base, the anthers unequal, the connectives thickened; ovary and base of styles hirsute; the styles petaloid and hooded at apex, ca. 5 mm long to fold of hood, the petaloid part to 2 mm long, 1.5–2 mm wide. *Fruit* a schizocarp of 1–3 samaras, each 3.5–4.0 cm long, densely pubescent on the body, sparsely pubescent on the wing, the body with 1 or 2 projections or reduced wings on each side; the wing membranaceous, gibbous along the dorsal margin (sometimes also on ventral margin), slightly broader toward apex.

The species is closely related to and perhaps only subspecifically separated from *S. lindenianum*. They are separated vegetatively by the pubescence of the lower blade surface (see key).

Stigmaphyllon humboldtianum flowers and fruits throughout the dry season from December to April, rarely as late as July.

Stigmaphyllon humboldtianum ranges from Mexico to Peru but is more common in South America. In Panama it occurs in drier parts of tropical moist forest, in premontane moist forest and in tropical dry forest.

CANAL ZONE: Without other locality, *Greenman & Greenman 5196* (MO). Near Madden Dam, small boat landing, *Lewis et al. 5299* (MO). Hospital Grounds, Ancón, 20–80 m, *Maxon 7* (NY, US). Farfan Beach, *Tyson & Blum 2614* (MO, SCZ). DARIÉN: Trail between Pinogana and Yavisa, ca. 15 m, *Allen 267* (A, F, MO). Río Ucurganti, *Bristan 1172* (MO, OS). Río Sambu, 0.5 mi above Río Venado, *Duke 9294* (DUKE, MO, OS). Isla Casaya, *Duke 10382* (MO, OS). Río Peñas, *Duke 10560* (OS). Between Río Jesús and Sabado, less than 100 m, *Hammel 1348* (MO). Chepigana District, Tucutí, 50 ft, *Terry & Terry 1376* (F, GH, MO). Marragantí, 10–200 ft, *Williams 666, 987* (both NY). PANAMÁ: Saboga Island, *Duke 10341, 10365* (both OS). San José Island, *Johnston 1301* (MO). VERAGUAS: 5 mi W of Santa Fé on road past Escuela Agrícola Alto Piedra, 800–1200 m, *Croat 22983* (MO, US).

3. **Stigmaphyllon hypargyreum** Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 318. 1862. TYPE: Panama, *Duchassaing* (P, holotype, not seen).

Vine; lower leaf surface, petioles, branches, peduncles, pedicels and sepals densely sericeous (trichomes type A). *Leaves* opposite, broadly ovate or oblong-ovate, acuminate or acute at apex, rounded to truncate or subcordate at base, 8–13(–15) cm long, 5–9(–10) cm wide, glabrous except for midrib above, densely sericeous below (trichomes types A and B), mostly eglandular, entire or irregularly crenate, the lateral veins 7 or 8 pairs, prominently ascending, the tertiary venation weakly prominulous; petioles 1–7 cm long, with 2 sessile, lateral glands at apex. *Inflorescence* of terminal or axillary, simple or branched, pedunculate pseudo-umbels of 10–16 flowers; pedicels inconspicuously pedunculate, 5–8 mm long; peduncle bibracteolate, 2–4 mm long. *Flowers* showy; sepals oblong-ovate, villous except at apex, turned inward above, the margin ciliate; all but 1 sepal glandular, the glands 2 mm long; petals orbicular, clawed, glabrous, at least the outer margin denticulate, the 2 petals on either side of the eglandular sepal larger, to 9 mm diam., concave, yellow or with orange on center below; 3 petals reduced, orange to red, the middle one often held higher, its claws thicker, erect; stamens unequal, 6 long with anthers covered at least in part by the flap-like apices of the styles, the anthers with the connective enlarged, introrsely dehiscent; pollen tacky; styles 3, glabrous except at base, with an apical flap, that of the style opposite the eglandular sepal concave. *Schizocarp* of 3 samaras; samaras 2–4 mm long, pubescent on body and along thickened ventral margin of wing, the wing dorsal, 3–5 mm wide at base, enlarged to 1 cm wide at apex; body angular-tuberculate.

The species is most easily confused with *Stigmaphyllon puberum* from which it is distinguished by its thicker, more conspicuously sericeous lower blade surfaces.

Flowering occurs principally in January and February but a single collection with flowers was made in November. This collection, *Gentry 2415*, is somewhat intermediate between *S. puberum* and *S. hypargyreum* and may represent a hybrid. Fruiting occurs principally in the late dry season from February to April.

The species occurs in regions of tropical moist forest in Panama and Colombia.

CANAL ZONE: ATTC Albrook Tower on Road C-15, *Blum & Dwyer 2163* (MO, SCZ). Pipeline Road near gate, *Croat 9325* (MO, SCZ). Albrook USATTC Site, *Dwyer 7313* (MO, US). Pipeline Road, 3–5 mi from Gamboa, *Gentry 2415* (GH, MO, NY). Between Farfan Beach and Palo Seco, 5 m, *Hunter & Allen 440* (F, MO). Pedro Miguel, *Piper 5511* (US). Gamboa, *Standley 28531* (US). Old Las Cruces Trail between Fort Clayton and Corozal, *Standley 29099* (US). Road to Pedro Miguel garbage dump, *Tyson & Blum 4020* (SCZ). Miraflores Lake, *White 280* (GH, MO, US). 1 mi SW of Cocolí, *Wilbur et al. 12871* (PMA). BARRO COLORADO ISLAND: *Croat 7040* (MO), *7226* (PMA), *7726, 7729* (both DUKE, F, MO, NY), *13476* (DUKE, MO, NY); *Foster 1033* (F, PMA), *1315* (PMA); *Shattuck 735* (F, MO); *Wilson 156* (F, MO); *Woodworth & Vestal 402, 621* (both A, F, MO). CHIRIQUÍ: Boquete, *Croat 35010* (MO). LOS SANTOS: 12 mi S of Macaracas, *Tyson et al. 2939* (MO, PMA, SCZ, US). PANAMÁ: Río Pequiní, between Salamanca hydrographic station and Río Boqueron, *Allen 17278* (MO). Without exact locality, *Duchassaing* (P?). WITHOUT LOCALITY: *Piper 5718* (MO).

4. **Stigmaphyllon lindenianum** Juss., Arch. Mus. Hist. Nat. 3: 362. 1843. TYPE: Mexico, *Linden* (P; F, type photo FM 35642).

Liana; moderately pubescent throughout with small, appressed, T-shaped trichomes, these sparse between the veins on the upper leaf surface. *Leaves* opposite or subopposite, ovate to suborbicular, obtuse to broadly acuminate, cordate or truncate to abruptly acute at the base, 5–16 cm long, 4–11 cm wide, entire to variably irregularly toothed, with a few marginal glands, deeply lobed when juvenile, bicolorous, palmately veined at the base, drying dark, the upper surface glabrous or nearly so, the lower surface diluted-sericeous with appressed T-shaped trichomes (type A) and fewer, scattered, stalked trichomes (type B), the free ends straight, acicular; petioles 1–5 cm long, with 2 sessile lateral glands at apex. *Inflorescence* usually consisting of several pseudo-umbels, often 1 sessile umbel at each node of the inflorescence with the ultimate branches bearing 2 pedunculate umbels; pedicels pedunculate, short or to 6 mm long; peduncles 2–5 mm long, with 2 small bracteoles at the apex. *Flowers* 5-parted; sepals acute to acuminate, appressed-pubescent, held inward at the apex, each bearing 2 thick glands ca. 2 mm long; petals yellow, soon falling, rounded at the apex, narrowed to a claw at the base, ca. 8 mm long, the margin revolute and irregularly denticulate; petal opposite the glandless sepal with a thickened claw, the blade sometimes marked with orange at base, held erect; lateral petals with the lower margin upturned and cupulate; stamens unequal, 2 or 3 elongating into hoods of styles, the anthers dehiscing inward, the connective much thickened; styles 3, to 4 mm long, petaloid and hooded at the apex, divergent. *Schizocarp* of 3 samaras, often becoming reddish, appressed-pubescent, especially on seminiferous area, the wing dorsal, 3–4 cm long, ca. 5 mm wide at base, broadened to ca. 9 mm near apex.

The species is most easily confused with *S. humboldtianum*, differing from that species in having closely appressed trichomes on the lower blade surface.

Flowering and fruiting occurs throughout the year but most flowering occurs from the late rainy season to the late dry season (October to April). Most fruits mature in the late dry season and earliest rainy season (March to June).

Stigmaphyllon lindenianum ranges from Mexico to northern South America (Venezuela) where it is mostly replaced by *S. humboldtianum*. In Panama *S. lindenianum* occurs in wetter parts of tropical moist forest, in premontane wet forest and in tropical wet forest. In contrast, the closely related *S. humboldtianum* occurs in drier areas.

BOCAS DEL TORO: Changuinola Valley, *Dunlap 248* (F, US). Water Valley, *Wedel 836* (MO), *1525, 1649, 1686* (all GH, MO, US). Old Bank Island, *Wedel 2044* (GH, MO, US). Water Valley, *Wedel 2754* (GH, MO). CANAL ZONE: Ahorca Largato to Culebra, *Cowell 380* (NY). Far end of Pipeline Road, *Croat 12780* (MO, SCZ). Cocolí Road, *Dwyer 7223* (MO, US). Pipeline Road, *Gentry 1950* (F, MO, SCZ). Pipeline Road, 16 mi N of Gamboa, *Gentry & Dressler 1968* (MO, SCZ). Gatún Station, *Hayes 69, 160, 680* (all NY). Near Frijoles, *Killip 3378* (US). Between Frijoles and Monte Lirio, 30 m, *Killip 12164* (US). NW shore of Gatún Lake, *Lewis et al. 1817* (CAS, MICH, MO, NY, US). 1–3 mi from Gorgona along old trail from reservoir, 40–150 m, *Maxon 4739* (US). Near Fort Randolph, *Maxon & Harvey 6508* (US). Pipeline Road 4 km NW of Gamboa, 50 m, *Nee 7582* (CAS, MO, PMA, TEX, U, US). Pipeline Road, *Shea 3* (MO). Fort San Lorenzo, *Tyson & Blum 3697* (MO, SCZ). BARRO COLORADO ISLAND: *Croat 4946* (MO, SCZ), *5107* (MO, PMA, SCZ), *7021* (MO, NY, PMA, SCZ), *7385* (MO), *10146* (F, MO, SCZ), *12843* (MO, SCZ), *14083* (MO); *Ebinger 242* (MO); *Foster 762* (PMA); *Shattuck 91* (MO), *181* (A, F, MO), *617, 1133* (both F, MO); *Wetmore & Abbe 63A, 220* (A, F, GH, MO). CHIRIQUÍ: 2 mi S of Puerto Armuelles, *Busey 475* (MO). Paso Canoas to Cañas Gorgas, 10.5 km N of Paso Canoas, *Busey 615* (MO). Burica Peninsula, Quebrada Tuco, 9 mi S of Puerto Armuelles, *Liesner 156* (MO, US). COLÓN: Road from Colón to Portobelo, 2–6 km E of

Transisthmian Highway, *Folsom 3730* (MO). Trail along first river W of Portobelo, *Gentry 5151* (MO, PMA). 3–4 km NW of Salamanca, 13 km NE of Buenos Aires, *Nee 9098* (MO, PMA, TEX). Quebrada Santa Marta along Caribbean coast road 4½ km SW of Piña, 0–5 m, *Nee 11717* (DUKE, F, MO, PMA, RSA, US). DARIÉN: Río Chucunaque, *Duke 8609* (MO). Río Sambu, 0.5 mi above Río Venado, *Duke 9294* (MO). Hill ca. 1 mi NE of Nura, ca. 200 m, *Duke 10083* (OS, US). Río Marti, ca. 6 mi upstream, ca. 100 m, *Duke 10151* (OS). Headwaters of Río Corso, 500 m, *Duke 11937* (MO, OS). Camp Dubaganala, helipad in promontane rain forest, *Duke 15497* (MO, US). Without locality, *Macbride 2719* (F, MO, US). PANAMÁ: Between Las Margaritas and Río Mamoní, *Duke 5863* (MO). El Llano-Cartí road, 8 mi above Panamerican Highway, *Dwyer & Nee 11993* (DUKE, MO, P, RSA). N of El Llano, 500–800 m, *Gentry 5585* (MO). Falls of La Chorrera, *Lewis et al. 5202* (MO). Sabanas, *Paul 270, 629* (US). 3 mi W of El Llano at Finca Risso, *Tyson 1734* (MO). El Llano-Cartí road, ca. 5 km from Panamerican Highway, *Witherspoon & Witherspoon 8723* (DUKE, MO). SAN BLAS: Duboganalla, 400 m, *Duke 10199* (OS, US). WITHOUT LOCALITY: *Hayes 617* (NY).

5. **Stigmaphyllon ovatum** (Cav.) Niedenzu, Ind. Lect. Lyc. Brunsb. 1900(2): 31. 1900.

Banisteria ovata Cav., Diss. 9: 429, *tab. 257*. 1790. TYPE: *Jussieu,* Santo Domingo (P, holotype, not seen).
Brachypteris borealis Juss., Malpigh Synopsis (Ann. Sci. Nat., Bot. Sér. 2. 13:) 291. 1840. TYPE: (not seen).
Banisteria picta H.B.K., Nov. Gen. Sp. Pl. 5: 161. 1822. TYPE: Colombia, Sinú, *Humboldt & Bonpland* (P; F, type photo FM 37485).
B. brachyptera DC., Prodr. 1: 591.1824. TYPE: French Guiana, Cayenne, *Perrotet* (P).
Brachypteris ovata (Cav.) Small, N. Amer. Fl. 25: 138. 1910.

Shrub, usually to ca. 1 m tall, erect, becoming somewhat scandent; stems viscidulous and closely appressed-pubescent when young, becoming glabrous (trichomes type A). *Leaves* opposite, ovate to ovate-lanceolate, obtuse to acute at the apex, obtuse to cuneate or rounded and biglandular at base, 3–9(–11) cm long, 1.3–4(–5) cm wide, the upper surface glabrous with veins scarcely visible, the lower surface with sparse short, appressed trichomes, lateral veins 4 or 5 pairs, ascending, weakly loop-connected, the margin entire; petioles sparsely pubescent, 4–12 mm long. *Inflorescence* umbelliform, 2–8-flowered, usually axillary or on short axillary branches, sometimes terminal; peduncle to ca. 2 mm long, bibracteate; pedicels 10–20(–30) mm long, appressed-pubescent to glabrous, thickened toward the apex. *Flowers* ca. 2.5 cm diam.; sepals deltoid to ovate, blunt at the apex, 3–4 mm long, appressed-pubescent, the glands oblong, 2.5–3.0 mm long; petals, including claw, 9–16 mm long, glabrous, yellow, fading orange, the blade orbicular, concave, denticulate, 7–12 mm diam.; stamens ca. 4 mm long, the filaments glabrous, thickened and laterally flattened toward the base, the anthers subelliptic; ovary densely villous, the styles to ca. 5 mm long, thickened toward the base, curved outward, glabrous, somewhat unequal, the stigmatic region borne on the inner edge on a knoblike protrusion ca. 1 mm below the tapered apex. *Fruits* subglobose, 1 or 2 coccous, 10–12 mm diam., the pericarp thick coriaceous with about 3 irregular, prominent ridges on each side, the dorsal wing thick, short, obtusely triangular, subcoriaceous, 3–4 mm long.

Stigmaphyllon ovatum is distinguished by its short-winged, coccoid fruit. It is sometimes separated from other species of *Stigmaphyllon* on the basis of this character into the genus *Brachypteris* A. Juss. (Adams, 1972).

Based on inadequate information the species appears to flower most of the year with most flowering probably occurring in the late rainy season and through-

out the dry season (October) November–April. Mature fruits have been seen in October.

The species ranges from Belize to the West Indies and south to Brazil. In Panama it is uncommon and currently known only from sandy coastal beaches in tropical wet forest along the Caribbean.

CANAL ZONE: Chagres, Isthmus of Panama, *Fendler 49* (MO). Chagres, *Hayes 357* (NY). Without other locality, *Hayes 828, 855, 865, 882* (all NY). COLÓN: Miguel de la Borda, *Croat 9861* (MO), *10073* (F, MO, SCZ). Ocean trail between Río Indio and San Miguel de la Borda, *Croat 36885* (MO). Trail above Río Indio, *Sullivan 122* (MO). PANAMÁ: Manzanilla Island, *Hayes 696* (NY).

6. **Stigmaphyllon puberum** (L. C. Richard) Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 289. 1840.—FIG. 14.

Banisteria pubera L. C. Richard, Actes Soc. Hist. Nat. Paris 1: 109. 1792. TYPE: French Guiana, *Leblond 44* (P, not seen).

Vine; moderately to densely appressed pubescent with T-shaped trichomes on most parts. *Leaves* opposite, oblong-ovate to ovate or lanceolate-ovate, long-acuminate, obtuse to rounded at the base, 8–17 cm long, 3–10 cm wide, glabrous above except for midrib, the lower surface glandular and densely appressed-pubescent throughout, with trichomes of 2 sizes, smaller closely appressed ones (type A) and larger shortly stalked ones (types B & D); glands sparse, dark stellate; the lateral veins of 7 or 8 pairs, the tertiary veins scarcely or not at all prominent; margin entire; petiole 1–4 cm long, with 2 sessile lateral glands at apex. *Inflorescence* a series of pseudo-umbels, axillary, to 12 cm long, divaricately branched, usually with a sessile pseudo-umbel at each node; peduncle 2–4 mm long, minutely bracteolate at the apex; pedicels pedunculate, 2–5 mm long; inflorescence branches, peduncles, pedicels and calyces densely pubescent. *Flowers* 8–16 per umbel; sepals to 4 mm long, ovate-oblong, rounded at the apex, appressed-pubescent on the outside, held against the stamens, all but 1 sepal bearing 2 glands, the fifth sepal sometimes with much reduced glands, glands broadly oblong, 2–3 mm long, with a thin, sticky covering; petals yellow, glabrous, rounded, clawed, 7–9 mm broad, the margins fimbriate, 3 petals opposite the eglandular sepal spreading, usually tinged with brick red, 2 petals on either side of the eglandular sepal held erect, strongly concave, yellow or brick red at center outside; stamens unequal, 4 reduced, the styles 3, glabrous, thin and broadly spreading at the apex, 2 unilaterally winged, 1 bilaterally winged. *Schizocarp* of 3 samaras; samara pubescent especially on body, dorsally winged, the wing broadest at base, 2–3 cm long, to 1.2 cm wide at base, ca. 5 mm wide near the apex.

The species is most easily confused with *Stigmaphyllon hypargyreum* but can be distinguished by its much sparser pubescence on the lower blade surface and by its broad-based samaras.

Flowering occurs from June to October. Fruits develop in about 1 month.

The species ranges from Guatemala to the West Indies, Peru, Brazil and the Guianas. In Panama it occurs in undisturbed parts of tropical moist forest.

BOCAS DEL TORO: Water Valley, *Wedel 716, 787* (both GH, MO), *847* (MO), *995* (GH, MO). Chiriquí Lagoon, *Wedel 1249* (GH, MO, US). Water Valley, *Wedel 2662* (GH, MO, US). John's

Creek, Chiriquí Lagoon, *Wedel 2761* (GH, MO, US). CANAL ZONE: Juan Mina, *Bartlett & Lasser 16510* (MO). Pipeline Road near Gamboa, *Clewell & Tyson 3267* (MO, SCZ). Boat dock near Frijoles, *Ebinger 85* (MO, US). Gamboa, *Tyson et al. 4589* (DUKE, MO, US). BARRO COLORADO ISLAND: *Bangham 496* (F, US); *Croat 11303* (MO, SCZ); *Foster 1033* (DUKE, F). COLÓN: Hills N of the Río Guanche, 1–200 m, *Davidse & D'Arcy 10070* (MO). Quebrada S. Marta, 4½ km SW of Piña, *Nee 11716* (MICH, MO, PMA, US). Río Fato, 10–100 m, *Pittier 3887* (F, US). Achiote, *Tyson et al. 4507* (MO, SCZ). DARIÉN: Boca de Cupe, 40 m, *Allen 908* (MO, US). Río Pirre, *Croat & Porter 15530* (MO). Río Ucurganti, *Duke 1154* (OS), *1171* (MO). Road from El Real to Pinogana, *Duke 4883* (GH, MO, US). Río Tuira between Río Punusa and Río Mangle, *Duke 14611* (MO). PANAMÁ: Río Mamoní below La Capitana, *Pittier 4580* (F, GH, US). SAN BLAS: Mulatuppu River, Ibidi, *Duke 8474* (MO, US). Above Aligandí River, *Duke & Bristan 340* (MO, US). Mainland opposite Aligandí, *Lewis et al. 198* (MICH, MO, NY), *200* (US). Playón Chico, *Stier 152, 233* (both MO).

14. TETRAPTERIS

Tetrapteris Cav., Diss. 9. 443. 1790. TYPE: *Tetrapteris inaequalis* Cav. = *T. citrifolia* (Sw.) Pers.

Tetrapterys Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 261. 1840. = *Tetrapteris* Cav., orthogr. mut.

Lianas, rarely *shrubs*. *Leaves* simple, opposite, papyraceous, chartaceous or coriaceous, entire; petioles sometimes with glands; stipules small, in pairs, single between the petioles, solitary at the base of the petiole or absent. *Inflorescences* axillary or terminal, generally cymose-paniculate, less frequently thyrsoid with flowers in terminal corymbs or umbels, sometimes simple umbels, corymbs or pseudoracemes; peduncles with 2 bracteoles at the apex or rarely lower on the peduncle; pedicels present and continuous with the peduncle; bracts and bracteoles sometimes conspicuous. *Flowers* yellow; sepals 5, ovate or oblong, united at the base, usually 4 of them biglandular, rarely eglandular or all 5 sepals glandular; petals yellow, clawed, glabrous, the limb orbicular, ovate or elliptic, the margin entire, denticulate or weakly undulate; stamens 10, weakly unequal, the filaments united into a ring or tube at the base, glabrous or sometimes pilose, the anthers ellipsoid or oblong-ellipsoid, glabrous or rarely pilose; styles free, erect, thick, glabrous, generally 1 of the 3 thinner, the apex truncate; internal angle obtuse or at a right angle, stigmatic, the external angle obtuse, acute or apiculate, the ovary trilobate, velutinous-tomentose or hirsute. *Fruit* a schizocarp of 2 or 3 samaras, the mericarp with a narrow dorsal wing and 4 lateral wings, these forming an X as seen from above, rarely vestigial, sometimes with muricate or laminate appendages present between the dorsal and lateral wings; body smooth or coarsely veined, the ventral areole oval to suborbicular; cotyledons almost equal, folded.

This is a genus with ca. 90 species in tropical parts of Central America, South America from Mexico to Argentina and the West Indies. It ranges from sea level to over 2,000 meters elevation.

a. Sepals densely tomentose; fruit with superior wing often more than 4 cm long; young branchlets and leaves woolly-tomentose; upper wings of the samaras 35–50 mm long, distinct to the base from the smaller ones and spreading, the body smooth between the medial crest and the 4 wings ..... 4. *T. macrocarpa*

aa. Sepals glabrous, moderately strigose or somewhat ciliate at the margin; fruit with superior wings less than 4 cm long; young branchlets and leaves variously pubescent but not woolly-tomentose; upper wings of the samaras free from lower wings or confluent with them (*T.*

FIGURE 14. *Stigmaphyllon puberum* (Rich.) Juss.—A. Fruiting branch (×⅝).—B. Fruit (×1½). [After *Ebinger 85* (MO).]

seemannii); the body smooth between the medial crest and lateral wings or bearing several short appendages (*T. discolor*).

b. Sepals strigose or substrigose, branchlets and peduncles copiously or densely strigose; leaf blades firmly coriaceous, strongly nervate and reticulate beneath ..... 7. *T. tysonii*

bb. Sepals glabrous or somewhat ciliate, branchlets and peduncles variously pubescent; leaf blades coriaceous to thin.

c. Pubescence on branchlets and abaxial side of leaves conspicuous, patulous, more than 1 mm high, trichomes furcate, rigid, erect and spreading; leaf blades firmly coriaceous, broad, cordate at base, 13–23 cm long, 9.5–14 cm wide ..... 3. *T. hirsutula*

cc. Pubescence on young branchlets and leaves inconspicuous, trichomes smaller, thinner, appressed or loosely subappressed, much less than 1 mm high; leaf blades papyraceous, usually narrower and smaller, the base cuneate or obtuse, never cordate.

d. Fruits more or less coccoid or nut-like, never conspicuously samaroid, the wings vestigial, much reduced and scarcely apparent ..... 6. *T. subaptera*
dd. Fruits samaroid, the wings conspicuous.
e. Samaras with several appendages between the dorsal and the side wings, these distinct from the base and spreading ..... 2. *T. discolor*
ee. Samaras with no appendages between the dorsal and lateral wings.
f. Fruits glabrate, the upper wings confluent with the lower ones, united at the base ..... 5. *T. seemannii*
ff. Fruits densely and conspicuously pubescent, the upper wings distinct to the base from the lower ones ..... 1. *T. crispa*

1. **Tetrapteris crispa** Juss., Malpigh. Synopsis (Ann. Sci. Nat. Bot. Sér. 2. 13:) 265. 1840. TYPE: *Richard* Herb. Juss. (P, not seen; F, photo FM 35597; MO, photo).

T. papyracea Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 334. 1862. TYPE: Colombia, Cundinamarca, Villavicencio, *Triana* (not seen).

Liana, the young stems densely pubescent with white, metacentric, sessile or stalked trichomes, soon glabrous. *Leaves* papyraceous to chartaceous, oblong-ovate to narrowly ovate or elliptical, acute to abruptly acuminate, obtuse to rounded at the base, (4.5–)6–14.5 cm long, (2.5–)3–7 cm wide, glabrous above, sparsely and mostly patulous-pubescent on the lower surface especially along the veins, sometimes glabrous in age except for a sparse pubescence along the major veins; major veins 4–5 pairs, prominently arcuate ascending; petioles 5–12 mm long, canaliculate, pubescent. *Panicles* terminal or upper axillary, longer or shorter than the subtending leaves, the branches densely pubescent, the trichomes whitish, appressed to patulous; bracts subrounded to oblong-elliptic or ovate, submembranaceous, 5–30 mm long, sparsely loose-pubescent. *Flowers* 12–18 mm in diam.; peduncles 2–7 mm long; pedicels 2–5 mm long; bractlets ovate, thin, pubescent, amplexicaul, 0.4–1.0 mm long; sepals elliptic, rounded at the apex, ciliate, otherwise glabrous, 2–3 mm long; calycine glands oblong-elliptic, to 3 mm long, the upper part sometimes free, somewhat spreading at least on drying; petals 3–5 mm long, yellow, glabrous, clawed, the blade suborbicular to obovate, the claw 1.2–1.8 mm long; stamens glabrous, exserted and recurved over the sepals, the filaments flattened, greatly tapered toward the apex, ca. 1.5 mm long, the anthers elliptic, 1.2–1.5 mm long; ovary densely hirsute-velutinous, the styles to 2.5 mm long, thick, glabrous, dilated at the apex. *Samaras* tan to pale brown, conspicuously pubescent with patulous whitish trichomes especially in the lower ½ of the wings and on the body; lateral wings thin, the superior wing oblong, rounded at the apex, rarely truncate to subacute, 1.5–3.0 cm long, (5–)7–10 mm wide, distinct from the inferior wing to the base, the inferior wing subrounded, obovate to oval, 6–18 mm long, the dorsal wing rounded, 2–5 mm high.

The species ranges from Panama, Colombia, Venezuela and the Guianas to Brazil and Bolivia. In Panama it is known chiefly from drier parts of tropical moist forest. Flowering occurs in the early dry season and fruits mature from January to March.

COCLÉ: Penonomé, *Williams 57* (MO, NY). LOS SANTOS: 16 mi S of Macaracas, Quebrada Bejuco, *Tyson et al. 2925* (F, MO, SCZ). PANAMÁ: Isla del Rey, *Duke 9552* (NY).

2. **Tetrapteris discolor** (G. F. W. Meyer) DC., Prodr. 1: 587. 1824.

Triopteris discolor G. F. W. Meyer, Prim. Fl. Esseq. 182. 1818. TYPE: Guyana, *Meyer* (not seen).
Tetrapteris cuspidata Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 336. 1862. TYPE: Colombia, Cundinamarca near Anapoima, Magdalena Valley, 600 m, *Triana 3389* (NY).

Liana or scandent *shrub*; stems slender, the younger stems sericeous, soon thinning but remaining sparsely pubescent, the older stems glabrous or with trichomes sparse, restricted to the depressions; trichomes T-shaped, whitish, small dense lenticels sometimes present. *Leaves* thin, elliptic to oblong-elliptic or ovate-elliptic, long-acuminate or less often abruptly acuminate at the apex, obtuse to acute at the base, less often subrounded, 6–16 cm long, 2.5–5.5(–7) cm wide, glabrous above, glabrous beneath except the midrib often sericeous when young, major lateral veins 4–7 per side; petioles 6–15 mm long, appressed-pubescent when young, glabrate in age. *Panicles* terminal or upper axillary, usually surpassing the leaves, the branchlets, peduncles and pedicels sericeous to weakly patulous-pubescent with whitish, T-shaped trichomes; bracts inconspicuous, oval to elliptic, 5–20 mm long, weakly appressed-pubescent on both sides, more densely so on the midrib beneath; peduncles 2–5 mm long; pedicels 2–5 mm long. *Flowers* with the sepals narrowly ovate, obtuse, 2.5–3.0 mm long, glabrous in the apical part except for ciliate margin, weakly villous between the glands; calycine glands thick, shiny, 1.5–2.5 mm long; petals clawed, yellow, glabrous, the blade obovate to oblong-elliptic, sagittate at the base, 4.0–5.5 mm long, 2.5–4.0 mm wide, the margin entire, the medial vein thickened near the base; claw thick, 1–2 mm long; anthers elliptic, ca. 1 mm long, glabrous; styles held ca. 1.5 mm above the sepals, slightly longer than the stamens. *Samaras* stramineous to brown, the wings thin but rigid, the veins sometimes weakly raised; superior wing narrowly spatulate, asymmetrical, 14–20 mm long, 6–10 mm wide, sparsely pubescent throughout with appressed T-shaped trichomes, the margin not confluent with the margin of the inferior wing, the inferior wing ovate to ovate-elliptic or obovate, 6–8 mm long, 4–5 mm wide, the dorsal crest 2–3 mm high; appendages irregularly linear to ovate, 1.5–5.0 mm long, borne between the dorsal and lateral wings; body 5–6 mm in diameter, densely appressed-pubescent.

The species ranges from Guatemala to Bolivia and the Lesser Antilles. In Panama it is known from wetter parts of tropical moist forest and from premontane wet forest. *Gentry 6811*, collected at La Mesa in Coclé Province, is the only collection from tropical wet forest but differs little from typical collections. In Panama, flowering occurs from the late rainy to early dry season, October to January, with fruits developing to mature size by March. Fruits are dispersed in the late dry season and early rainy season as late as May. One collection, *Allen 1778*, tentatively identified as this species is unusual in flowering in May.

Tetrapteris discolor is easily confused with *T. seemannii* especially when in flower since the key character separating them is in the fruits. *Tetrapteris discolor* tends to be more densely pubescent with more pubescence persisting on the stem in age. Its leaves tend to be gradually long-acuminate, 2.5–3 or more times longer than wide. *Tetrapteris seemannii*, on the other hand, has leaf blades merely acute to shortly acuminate at the apex, usually about 2–2.5 times longer than wide. Stems bear less pubescence on the younger parts and are soon glabrate.

BOCAS DEL TORO: Above Almirante on road to Changuinola, *D'Arcy 11221* (MO, PMA). Water Valley, *Wedel 1409, 1521, 1743* (all GH, MO, US). CANAL ZONE: Near mouth of Río Chagres, *Allen 892* (GH, MO, NY, US). Between France Field and Cativa1, *Standley 30388* (US). BARRO COLORADO ISLAND: *Aviles 176* (F, MO); *Wetmore & Abbe 186* (A, F, MO); *Wilson 149* (MO). CHIRIQUÍ: Cerro Colorado, 15–18 mi off Panamerican Highway, above San Felix, 800–1000 m, *Croat 33161, 33178* (both MO). Boquete, *Davidson 624* (A, MO, US). 17 km NE of San Felix on new road to Cerro Colorado copper mines, 1000 m, *Nee 10746* (F, MICH, MO, NY, PMA, US). COCLÉ: El Valle, *Allen 1778* (MO); *Gentry 6811* (DUKE, F, MO, PMA, US). WITHOUT LOCALITY: *Pittier 5402* (US).

3. **Tetrapteris hirsutula** Cuatr. & Croat.[17] TYPE: Panama, *Bristan 1301* (US-2629988, holotype; MO, isotype).

Liana, the younger stems densely hirsute, the pubescence usually apparently simple, stiff, translucent, more than 1 mm long, the longer trichomes often underlain with much shorter bifurcated trichomes. *Leaves* stiffly coriaceous, ovate or ovate-elliptic, abruptly acuminate at the apex, weakly cordate at the base, (7–) 20–23 cm long, (4.7–)11–14 cm wide, usually broadest near the middle, glabrous above except sometimes weakly pubescent on the midrib in the lower ½ of the blade, sparsely pubescent throughout, below with erect bifurcate trichomes, much denser on the midrib, the trichomes chiefly bifurcate with one branch mostly longer than the other; major veins 6–10 pairs, moderately straight to curved, weakly loop connected; petioles 4–10 mm long, densely pubescent like the branchlets. *Panicles* terminal or in upper axils, the branches densely hirsute like the stems. *Flowers* not seen; fruiting peduncles 1.5–2.0 mm long, the pedicel articulation swollen, the pedicels 4–6 mm long, the bracteoles ovate, concave, hirsute to strigose abaxially, glabrous adaxially, peduncles and pedicels densely hirsute; calyx ovate, glabrous, rounded at the apex, ca. 2.3 mm long, the calycine glands oblong, ca. 3 mm long; ovary densely whitish hirsute-velutinous, the styles glabrous, ca. 1.6 mm long, dilated at the apex. *Samaras* pale brown, densely pubescent with sessile to stalked, patulous, T-shaped trichomes; lateral wings rigidly subcoriaceous, the superior wing oblong-obovate, 21–37 mm long, 10–17 mm wide, asymmetrically obtuse at the apex, scarcely or not at all confluent with the inferior wing, the latter 7–14 mm long, 5–7 mm wide, ovate to elliptic, constricted at the base, rounded at the apex; dorsal wing 2–8 mm high, suborbicular; seed ovoid, ca. 7 mm long, central areole 2.6–3.0 mm in diameter.

This species is known only from Panama in Darién Province, probably from tropical wet forest and premontane rain forest. Mature fruiting collections were made in October.

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[17] *Tetrapteris hirsutula* Cuatr. & Croat, spec. nov. (subgenus *Caulolepis* Niedenzu, sect. *Lophogyna* Niedenzu). Folia coriacea rigidula ovata vel ovato-elliptica, basi cordata apice acuminata, breviter petiolata; lamina (12–)20–23 × (9–)11–14 cm, adaxiale glabra costa plana nervis lateralibus plus minusve depressis superficie interdum bullata, abaxiale costa elevata, densiuscule subtomentoso-hirsutula pilis bifurcatis patulis. Flores 2–4 in cyma, sed specimina fructifera tantum visa. Pedicelli 4–6 mm longi rigidi pedunculati hirtuli pedunculo crassiore 1.5–2.0 mm longo, hirtulo pilis patulis circa 0.5 mm, sepala ovata glabra. Samarae densiuscule pubescentes, nuce ovoidea circa 7 mm longa areola centrali 2.6–3.0 mm diametienti, dorso inter alas sublaevi vel parcis rugositatis transversis parum notatis. Alae rigidae subcoriaceae sursum gradatim tenuiores, superiores 21–28 × 10–11 mm, obovato-oblongae apice asymmetrico obtuso, inferiores 7–10 × 5–7 mm, ovatae vel ellipticae basi constricta apice rotundato; ala dorsalis 2–3 mm alta semiorbicularis.

FIGURE 15. *Tetrapteris macrocarpa* Johnston. Fruiting branch (×½). [After *Johnston 1036* (US).]

DARIÉN: Cabecero del Río Pirre, *Bristan 1301* (MO, US). Río Cuasi, main stream 0.25 mi S of Tres Bocas, *Kirkbride & Duke 1126* (MO, SCZ).

4. **Tetrapteris macrocarpa** Johnston, Sargentia 8: 172. 1949. TYPE: Panama, *Johnston 58* (GH, holotype; US, isotype).—FIG. 15.

T. crispa ssp. *crispa* var. *subcordata* fo. *macrocarpa* Niedenzu, in Engler, Pflanzenreich IV. 141. (Heft 91): 214. 1928. TYPE: Panama: Collector not specified, possibly Hayes (S).

T. acapulcensis sensu Standley & Steyermark, Fl. Guatemala (Fieldiana Bot. 24:) 497. 1946. Not *T. acapulcensis* H.B.K.

T. calophylla sensu Seem. in Bot. Voy. Herald 92. 1853 and Standley in Fl. Costa Rica (Publ. Field Mus. Nat. Hist. Bot., 18:) 591. 1937. Not *T. calophylla* Juss. 1840.

T. glabrifolia sensu Small in N. Amer. Fl. 25: 126. 1910 and Standley in Flora of Panama Canal Zone 228. 1928. Not *T. calophylla* var. *glabrifolia* Griseb.

Liana, or rarely a *shrub*, the stems slender, tomentose when young with sessile and stalked T-shaped trichomes, the patulous trichomes falling free leaving a residue of appressed, T-shaped trichomes; stem surface ultimately glabrous in part; trichomes with lateral branches flattened. *Leaves* moderately thick, oblong-elliptic to broadly ovate, abruptly acuminate to bluntly acute at the apex, rarely almost rounded, obtuse to truncate or rounded at the base, (4.5–)8–13(–15) cm long, (2.5–)5–8(–10) cm wide, appressed-pubescent when young, adult blades glabrous above, glabrous beneath except densely appressed- or patulous-pubescent on major veins, sometimes weakly pubescent on surface near the vein axils; major lateral veins in 4–6 pairs; petioles (4–)10–15(–22) mm long, narrowly canaliculate, appressed-pubescent. *Panicles* terminal or upper axillary, dichotomously branched, densely tomentose, 15–30 cm long; bracts conspicuous, persistent, broadly reniform to suborbicular, long petiolate, 1.0–1.5 mm long, 1.1–1.7 mm wide, gray to pink, densely appressed- or patulous-pubescent. *Flowers* 13–17 mm broad, umbellate; peduncles 2–4 mm long; pedicels 2–5 mm long; sepals ovate, blunt at the apex, sericeous to tomentose, the calyx glands 8, 2.5–4.0 mm long; petals yellow turning orange, red, or salmon in age, sometimes only at the center of the blade, prominently clawed, the blade almost rounded, ca. 7 mm wide, the margin dentate to lacerate-dentate; anthers ca. 1.5 mm long; styles ca. 2 mm long. *Samaras* stramineous, persistently sericeous-tomentose, the pubescence most dense near the base and on the seminiferous area; wings moderately thick, the superior wing oblong, rounded to nearly truncate at the apex, 3.5–5.5 cm long, 10–14 mm wide, not at all confluent with the inferior wing, the latter 6–15 mm long, 3–6 mm wide, the dorsal crest 2–3 mm high, appendages lacking between the dorsal and lateral wings; body 8–9 mm in diam., densely tomentose.

This species ranges from Guatemala and Belize to Panama. In Panama the species occurs in thickets and on the margins of mature forests and waterways principally in regions of tropical moist forest but also in premontane wet forest. Flowering occurs principally during the early rainy season from June to August with fruits maturing to full size by September to November. Fruits are dispersed in the dry season usually before the end of February. Flowering rarely occurs as late as September. Specimens collected by Nee (*8124, 8151, 9916*) near Santa Fé in Veraguas are unusual in having smaller leaves and because they flowered in November.

BOCAS DEL TORO: Bocas del Toro Island, *Durkee 71-141* (F, MO, SCZ). Water Valley, *Wedel 1665* (GH, MO, US). CANAL ZONE: Gamboa, *Allen 1971* (GH, MO, NY, US). Fort Sherman, *Blum 1498* (MO). Beach at Fort Kobbe, *Duke 4203* (MO). Pipeline Road, premontane wet forest, *Gentry 1951* (F, GH, MO, NY). Pipeline Road, 2–4 mi N of Gamboa, *Gentry 6532* (MO, PMA). Cerro Galero, 2 km from Pacific Ocean near W boundary of Canal Zone, 350–400 m, *Gentry 6612* (MICH, MO, NY, PMA). Across from Summit Gardens at Summit Naval Radio Station, *Mori & Kallunki 4727* (MO, PMA). ½ km W of Summit Gardens, 75 m, *Nee 7043* (CAS, DUKE, F, K, MEX, MICH, MO, NY, PMA, TEX, US, VEN). Between France Field and Cativa1, *Standley 30354* (US). BARRO COLORADO ISLAND: *Chickering 49* (F); *Croat 12641, 12703* (both F, GH, MO, SCZ); *Foster 1419* (DUKE, MO, PMA), *1788* (DUKE, GH, MO, PMA), *1913* (DUKE, F, MO, PMA); *Starry 285* (F, MO). CHIRIQUÍ: Boquete, *Davidson 831* (F, GH, MO, US). Road to Cerro Colorado mining camp, ca. 45 km N of San Felix, ca. 800 m, *Mori & Dressler 7901* (MO). Between Cerro Vaca and Hato Loro, *Pittier 5381* (US). COCLÉ: La Mesa, *Dwyer 8319* (DUKE, MO, RSA, US). DARIÉN: Forest near Santa Fé, *Duke 8428* (MO, OS, US). Río Pucro below village of Pucro, *Duke 13112* (OS). Río Tuira between

Boca de Cupe and mouth of Río Pucro, *Gentry & Mori 13526* (COL, F, GH, MICH, MO, P, PMA, US). 3 mi N of Santa Fé, *Tyson et al. 4617* (GH, MO, SCZ). HERRERA: Roadside and hills between Las Minas and Pesé, 9000–12,000 ft, *Burch et al. 1325* (DUKE, F, K, MICH, MO, NY, RSA, US, VEN). PANAMÁ: Cerro Campana, trail to Chica, 600–800 m, *Allen 2645* (MO, US). Cerro Campana, *Bartlett & Lasser 16921* (MO). Gallery along Río Terribe near Panamerican Highway and El Real, *Duke 5663* (MO, PMA). Gallery along Río Mamoní, *Duke 5685* (MO, US). Perlas Islands, Pedro Gonzales Island, *Dwyer 1704* (MO, US). San José Island, *Erlanson 405, 532* (both GH, NY, US). Between Cainito and El Llano, *Gentry & Tyson 1711* (MO, NY, SCZ). Panama City, *Hayes 398* (MO). San José Island, *Johnston 58, 239* (both US), *438* (GH, MO, US), *1036* (US). E end of Playa Grande jeep trail, San José Island, *Johnston 1252* (GH, MO). Without exact locality, *Seemann 84* (BM, MO, NY, US). 2 mi W of El Llano on Interamerican Highway, *Tyson 6815* (MO, PMA). SAN BLAS: Mainland opposite Aligandí, *Lewis et al. 199* (GH, MO, UC, US). VERAGUAS: Hills W of Soná, 500 m, *Allen 1041* (GH, MO, NY, US). Isla Coiba, *Colonette 464* (US); *Dwyer 2348* (MICH, MO). 5 km S of Santa Fé, 250–300 m, *Nee 8124* (COL, GH, MICH, MO, NY, PMA, US, VEN). Quebrada El Nava at Santiago, Santa Fé road bridge, 11 km S of Santa Fé, 220 m, *Nee 8151* (F, MICH, MO, PMA, US), *9916* (MICH, MO, NY, PMA, US). Santiago, *Seemann 1216* (BM, MO, NY, US).

5. **Tetrapteris seemannii** Triana & Planch., Ann. Sci. Nat. Bot. Sér. 4. 18: 335. 1862. LECTOTYPE: *Seemann* (BM, not seen; MO, photo). PARATYPE: *Duchassaing* (P).

T. alloicarpha Rusby, Descr. S. Amer. Pl. 39. 1920 TYPE: Colombia, *Smith 343* (NY, holotype; A, F, GH, MO, P, S, isotypes).
Banisteria ferruginea sensu Seemann, Bot. Voy. Herald 92 (in part). 1853. Not Cav. 1790.

Liana or scandent *shrub*, the stems slender, sparsely pubescent with T-shaped trichomes when young, soon glabrous, bearing interpetiolar ridges at least when young. *Leaves* thin, elliptic to oblong-elliptic or ovate-elliptic, shortly acuminate to acute at the apex the acumen downturned, mostly acute to obtuse, or sometimes rounded at the base, 5.5–13.0(–16.0) cm long, 2–7 cm wide, glabrous above, glabrous beneath except the midrib at least sometimes sericeous when young, both surfaces with scattered glands, less than 0.5 mm in diam.; major lateral veins 4–7 per side; petioles 5–11 mm long, glabrous. *Panicles* terminal and upper axillary, usually exceeding the leaves; branches, peduncles, and pedicels sericeous, soon glabrate; bracts inconspicuous, oval to elliptic, appressed-pubescent, especially near the base, 5–20 mm long; peduncles 2–5 mm long; pedicels slender, 2–5 mm long; sepals narrowly ovate, obtuse, 2.5–3.0 mm long, glabrous except for ciliate margin. *Flowers* with the calycine glands thick, shiny, 2.0–2.5 mm long; petals clawed, yellow, probably turning orange in age, glabrous, the blade obovate to oblong-elliptic, sagittate at the base, 4.0–5.5 mm long, 2.6–4.0 mm wide, the margin entire, the medial vein thickened toward the base, the claw thick, 1.5–2.0 mm long; anthers elliptic, glabrous, 1.0–1.2 mm long; styles held ca. 1.5 mm above the sepals, slightly longer than the stamens. *Samaras* stramineous to brown, glabrous or nearly so, the wings thin but rigid, the veins often conspicuous, the superior wing narrowly spatulate, 15–30 mm long, 6–10 mm wide, the inferior wing ovate to obovate or rarely spatulate-oblong, 6–9 mm long, 4–6 mm wide, the adjacent margins of the superior and inferior wings confluent and continuous at the base, the dorsal wing semi-orbicular, rigid, 2–4 mm high, the appendages usually lacking between dorsal and lateral wings; body glabrous, ca. 6 mm diam.

The species is known from Panama and Colombia. In Panama the species is known from tropical moist forest and premontane moist forest in thickets, road-

sides, secondary forests and margins of primary forests. In general the species inhabits drier areas than does either *T. discolor* or *T. macrocarpa*. In Panama *T. seemannii* is most easily confused with *T. discolor*. See that species for a discussion of the differences.

Flowering occurs in September and October, rarely as late as November, with the fruits developing to mature size by late November. Fruits are dispersed in the dry season beginning in December and are usually lost by late March.

CANAL ZONE: Near Madden Dam, Azote Caballeo Road near Rehajuela, *Dodge 16598* (MO). Albrook A.F.B., USATTC, *Dwyer & Robyns 60* (MO). France Field, USATTC Mine Emplacement, *Dwyer 8527* (MO, RSA, SCZ, US). Road K-19, 2 mi from W border of Canal Zone near Canal, *Gentry 1778* (DUKE, F, GH, MO, NY, SCZ). Trail along Río Petitpie from road to Fort Sherman from Gatún Locks, *Mori & Kallunki 2707* (MO, PMA). Between France Field and Cativa1, *Standley 30294* (US). Fort Sherman, *Standley 31136* (US). 1 mi N of Summit Gardens, *Tyson & Blum 1995* (MO, SCZ). CHIRIQUÍ: Guanabano, 2–4 km S of Puerto Armuelles, *Busey 496* (CR, DUKE, MISSA, MO, PMA, RSA, TEX). Burica Peninsula, 2 mi SW of Puerto Armuelles at Quebrada Punta de Piedra, *Croat 22459* (MO, US). DARIÉN: Near Refugio, 15–20 mi N of Santa Fé, *Duke 10286* (US). El Real Quebrada, *Duke & Bristan 319* (MO, OS). Cerro Yavisa River, *Duke & Bristan 421* (MO, OS, US). LOS SANTOS: Vicinity of Tonosí, between Tonosí and Guanico, *Stern et al. 1883* (MO, US). Tonosí to Guanaco, *Tyson et al. 3111* (GH, MO, SCZ). PANAMÁ: Pacora, 35 m, *Allen 1124* (F, GH, MO, NY, US). Río Pita, 1–3 mi above confluence with Río Maestra, *Duke 4742* (MO). Panama Viejo, *Duke 5713* (CAS, MO). San José Island, *Johnston 103* (MO), *369* (GH, US), *480, 1072* (both GH), *1391* (MO, US). Bella Vista, near sea level, *Killip 12026* (NY, US). Without locality, *Paul 385* (US). Near Punta Patilla, *Standley 26231* (US). SAN BLAS: Mainland opposite Aligandí, *Lewis et al. 179* (GH, MO, US). WITHOUT LOCALITY: *Seemann 1215* (US).

6. **Tetrapteris subaptera** Cuatr., Webbia 8: 423–425. 1958. TYPE: Colombia, Valle, El Forge, Buenaventura, 0–5 m elev., *Killip & Cuatrecasas 34941* (US, holotype).

Liana, the branches appressed ferruginous-pubescent, becoming eventually glabrous. *Leaves* opposite, coriaceous, lanceolate to ovate-lanceolate or oblong-lanceolate, acute to acuminate at apex, obtuse to acute at base, 5–13 cm long, 2–5.5 cm wide, glabrous and shiny above, glabrous or sometimes minutely appressed-pubescent below, minutely and obscurely glandular, usually also with 1 or 2 pairs of plate-shaped glands along the midrib near the base; primary lateral veins 6–9 pairs; petioles 5–10 mm long, eglandular, appressed-pubescent, glabrous in age; stipules interpetiolar, deciduous. *Inflorescence* terminal, cymose-paniculate, equalling the uppermost leaves, the axis and branches angular, appressed, ferruginous-pubescent. *Flowers* 1.8–2 cm diam., often 4-umbellate, bracts ovate, obtuse at apex, ca. 1.5 mm long; peduncle thickened, 3–5 mm long, densely appressed-pubescent; pedicels 2–4 mm long; bracteoles paired, opposite, clasping, ovate, subacute, ca. 1 mm long; sepals 2–2.5 mm long, rounded at the apex, glabrous or subglabrous, densely ciliate; calyx glands 8, oblong, ca. 3 mm long; petals yellow, glabrous, the limb suborbicular or ovate-orbicular, 5.5–8 mm long, emarginate at base, the margin denticulate, the claw thick, 1.5–2.5 mm long; stamens somewhat unequal, united at the base into a tube, villous outside at the base, 1.5–2 mm long; anthers oblong-ellipsoid, ca. 1.5 mm long, the connective glabrous, thickened dorsally; ovary hirsute; style glabrous, broadly flattened subapically, recurved at apex. *Samara* with vestigial wings, ovate, rugose, drying 6–11 mm long, sparsely to densely subappressed pubescent, the lateral wings reduced, 2–8 mm long, deltoid and rounded at apex, the dorsal wing about equal

to lateral wings but forming a sharp crest on the fruit body; inferior wings lacking altogether, the body ca. 8 mm diam.

The species ranges from eastern Panama to the Pacific Coast of Colombia, apparently restricted to mangroves on the Pacific coast. In Panama the species is known only from tropical moist forest life zone in Darién Province.

The species fruits in the early rainy season in July and the fruits are presumably water dispersed rather than wind-dispersed, which is the usual method of fruit dispersal for the genus.

DARIÉN: Puerto Santa Dorotea, Punta Piña, *Dwyer 2287* (MO).

7. **Tatrapteris tysonii** Cuatr. & Croat.[18] TYPE: Panama, *Tyson 3579* (MO-1841778, holotype; PMA, isotype).

Liana, stems slender, subsericeous when young, sparsely appressed pubescent to glabrate in age, lacking lenticels; trichomes metacentric, sessile. *Leaves* moderately thick, oblong-elliptic, gradually to abruptly acuminate, usually obtuse at the base, sometimes acute or subrounded, 6.5–18.5 cm long, 2.6–7.0 cm wide, drying yellowish green, glabrous on upper surface, sparsely appressed-pubescent on lower surface, denser on the veins, major veins 4 or 5 pairs, prominently ascending, the upper surface semiglossy, the reticulate venation prominulous on drying, the lower surface almost matte on drying, the reticulate venation less conspicuous than on the upper surface; petioles canaliculate, 1.0–1.5 cm long, appressed-pubescent; stipules thick, narrowly triangular, persistent, appressed pubescent, ca. 2 mm long. *Panicles* terminal, less than 15 cm long; bracteoles 0.8–2.0 cm long, ovate-elliptic, glabrous above except along the midrib, densely-appressed pubescent on the lower surface; peduncles 5 mm long; pedicels 3 mm long; peduncles and pedicels densely appressed pubescent, completely obscuring the surface, both subtended by narrowly deltoid bractlets ca. 1 mm long, these sparsely appressed pubescent on the outer surface. Most *flower* parts not seen; anthers oblong, ca. 1.3 mm long; ovary densely pubescent, the trichomes metacentric, whitish, both sessile and weakly stalked, obscuring the surface; styles glabrous, 2.4 mm long, truncate at the apex, the medial style bilaterally symmetrical, the two lateral styles unilaterally flared at the apex. *Samaras* brown, sparsely appressed pubescent, densely so on the seminiferous area, the wings moderately thin, weakly viscidulous upon magnification, the superior wing oblong, rounded at the apex, 3.5–3.8 cm long, 7–11 mm wide, not at all confluent with the inferior wing, the latter to 12 mm long and 5 mm wide; dorsal crest to 6 mm long, rounded to truncate at the apex, appendages lacking between the dorsal and lateral wings; body 8–9 mm broad, densely tomentose.

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[18] *Tetrapteris tysonii* Cuatr. & Croat, spec. nov. (subgenus *Tetrapteris*, sect. *Tetrapteris* = subgen. *Coulolepis* Niedenzu, sect. *Lophogynixa* Niedenzu). Folia coriacea rigidula oblongo-elliptica, paulo attenuata vel subite acuminata, basi saepe obtusa, interdum cuneata, 6.5–18.5 × 2.6–7 cm, adaxiale glabra nitidaque, prominule reticulata, abaxiale prominente nervata prominuleque venuloso-reticulata, sparse adpresse-pilosa. Petioli 1–1.5 cm longi. Samarae omnium copiose appresse vel subadpresse albo-pilosae, nuce 8–9 mm longa; 4 alae tenuiter chartaceae, superiores 35–38 × 7–11 mm, oblongae apice rotundato, inferiores 12 × 5 mm, omnes ad basim contractae, crista dorsali semiorbiculata circa 6 mm longa. Rami inflorescentiae, pedunculi pedicelique dense adpresseque pilosi.

This species is known only from the type locality on Cerro Jefe in Panamá Province. It occurs in premontane rain forest or tropical wet forest at an elevation of approximately 650 m. Flowering time is unknown. Fruits mature during April and May.

PANAMÁ: 4 mi E of Cerro Jefe, 2000 ft, *Tyson 3579* (MO, PMA).

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FLORA OF PANAMA

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part VI

FAMILY 98. CALLITRICHACEAE

Diminutive aquatic or paludal *herbs*. *Leaves* opposite, entire, estipulate. *Inflorescences* of solitary unisexual flowers; bracteoles mostly 2. *Flowers* naked, staminate flowers of 1 stamen; pistillate flowers of 2 united carpels, 4 locular, the styles 2, the ovules 1 in each locule, pendulous, anatropous. *Fruit* a schizocarp; seed with fleshy endosperm.

This family of one genus, *Callitriche*, and about 25 species is recorded from almost every country in the world but it has not yet been found in Panama or perhaps Costa Rica. It may sometime be found there. In some cases, plants are submerged aquatics, but in others, species may occur in the water or on muddy surfaces such as cattle trails in which cases they resemble mosses. The solitary anther is sometimes conspicuously yellow.—W. G. D'Arcy.

ANN. MISSOURI BOT. GARD. 67: 947. 1980.

FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part VI

FAMILY 109. SABIACEAE[2]

ALWYN H. GENTRY[3]

Trees, shrubs, or *lianas*. *Leaves* alternate to subopposite, simple to pinnately compound, estipulate. *Inflorescences* terminal, axillary, ramiflorous or cauliflorous, paniculate, racemose, or cymose. *Flowers* small, usually perfect, sometimes monoecious; sepals 3–5, imbricate, the petals (4–)5(–6), opposite the sepals; stamens 2–5, if 2 with 3 staminodes, opposite the petals and attached to their bases; ovary ovoid to conical, bilocular with 2 usually superposed ovules per locule, the style simple or bifid; disc usually present, 3–8 dentate. *Fruit* single-seeded and drupaceous or of 2 partially fused drupaceous carpels, exocarp fleshy, endocarp more or less woody, sometimes conspicuously sculptured; seeds with little or no endosperm.

The Sabiaceae is a family of three genera and about 80 species, disjunct between southeast Asia and tropical America. Relationships with Sapindaceae, Icacinaceae, and even Menispermaceae have been suggested. Tropical Asian *Sabia* with five fertile stamens, is sometimes considered to constitute a possibly not closely related monogeneric family with *Meliosma* and the exclusively South American *Ophiocaryon* then segregated as Meliosmaceae. Only *Meliosma* is represented in Panama.

The unusual floral configuration with both stamens and petals opposite the sepals characterizes the family; in the Panamanian genus only 2 stamens are fertile and two of the petals are reduced and fused to the filament bases. Vegetatively the thickened petiole bases and tendency to serrate or at least remotely dentate leaf margins are useful characters. In the field the typically persistent fruits are much more commonly encountered than are flowers. In some species most of a preceding year's fruit crop may still be present on a tree subsequent to development of the current year's fruits. The fruits of most of the Panamanian species are especially noteworthy for their extremely hard endocarps.

The family is of no economic importance, althought its excellent fossil record makes it of special phytogeographical and paleobotanical interest. A few Asian species of *Meliosma* are occasionally cultivated as ornamentals.

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[2] Assisted by National Science Foundation grant DEB 79 05078 (A. H. Gentry, principal investigator).

[3] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

ANN. MISSOURI BOT. GARD. 67: 949–963. 1980.

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1. MELIOSMA

Meliosma Blume, Cat. 32. 1823. LECTOTYPE: *M. lanceolata* Bl.

Millingtonia Roxb., Pl. Corom. 3: 50. 1820, non L.f., 1781. TYPE: *M. simplicifolia* Roxb. = *Meliosma simplicifolia* (Roxb.) Walp.

Wellingtonia Meisn., Pl. Vasc. Gen. 2: 207. 1840. TYPE: *Millingtonia simplicifolia* Roxb. = *Meliosma simplicifolia* (Roxb.) Walp.

Kingsboroughia Liebm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 2: 67. 1850. TYPE: *K. alba* (Schlecht.) Liebm. = *M. alba* (Schlecht.) Walp.

Lorenzanea Liebm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 2: 69. 1850. LECTOTYPE: *L. glabrata* Liebm. = *M. glabrata* (Liebm.) Urb.

Oligostemon Turcz., Bull. Soc. Nat. Mosc. 31: 447. 1858. non Benth. 1865. TYPE: *O. schlimii* Turcz. = *M. schlimii* (Turcz.) Tr.

Heterapithmos Turcz., Bull. Soc. Nat. Mosc. 32: 265. 1859. TYPE: *H. floribunda* Turcz.

Atelandra Bello, Anales Soc. Esp. Hist. Nat. 10: 289. 1881., non Lindl. 1839. TYPE: *A. laurina* Bello. = *M. herbertii* Rolfe.

Trees and *shrubs*, usually evergreen. *Leaves* alternate (rarely subopposite) frequently clustered at the twig apices, simple (Panama) or pinnately compound, entire or frequently dentate, the petiole usually thickened at base. *Inflorescence* terminal to cauliflorous, frequently ramiflorous, paniculate, usually pyramidal, the bracts reduced, inconspicuous, the usually numerous flowers sessile or pedicellate. *Flowers* small, zygomorphic; sepals 5 (in Panama, rarely reduced to 3 elsewhere); petals 5, the 3 outer ones larger and usually more or less suborbicular, the 2 inner ones much reduced, thin and strap-shaped, opposite the fertile stamens and more or less fused to the filament bases; fertile stamens 2, the filament short, flat, incurved at tip, the anthers bilocular, the thecae short and thick, transversely dehiscent, often separated by the thickened connective, the staminodes 3, opposite and more or less fused with the bases of the larger petals, sometimes forming a cap over the pistil; ovary globose to conical, bilocular, rarely trilocular, with 2 more or less superimposed ovules in each locule, the style minute to elongate, the stigma minute; disc usually present, typically 5-toothed. *Fruit* a drupe, globose to obovoid, sometimes with a slight median keel, with a single

large seed (rarely with 2 ovules developing per fruit according to Beusekom), the mesocarp thin, the endocarp frequently exceptionally hard: seed more or less globose, usually somewhat concave ventrally, without endosperm.

Meliosma is predominantly of Laurasian distribution with about 15 species in southeast Asia (only one crossing Wallace's line) and 40 in the neotropics. The neotropical species, ranging from Mexico and the West Indies to Brazil, are predominantly plants of wet middle elevation forests and are concentrated in Colombia (12 species, mostly in the Andes) and southern Central America (11 species in Costa Rica, 10 in Panama). All but one of the New World species belong to section *Lorenzanea* of subgenus *Meliosma* as defined by Beusekom; the section is exclusively neotropical, the subgenus being found also in Asia. A single New World species, *M. alba* of Mexico, belongs to the second subgenus of *Meliosma*, subg. *Kingsboroughia*, which has a disjunct relict subtropical Laurasian distribution. *Meliosma alba*, which also occurs in south central China, is the only New World species of the genus with compound leaves. *Meliosma* has an unusually long and well-documented fossil record and was widespread both in North America and Eurasia during much of the Tertiary Period.

One Panamanian *Meliosma* is not accounted for here. This plant is represented by three fruiting collections (*Hagen & Hagen s.n., 2112, 2118*, all MO) from Cerro Horqueta, Chiriquí, between 6,000 and 6,500 ft. It is related to *M. vernicosa* and *M. occidentalis*, keying out with the latter on account of its membranaceous leaves. The fruits, somewhat smaller (1.5–1.9 cm diam.) than usual in *M. occidentalis* and differing also in a conspicuously asymmetric base, are very like those discussed above under *M. vernicosa* for similarly problematic, but coriaceous-leaved, extra-Panamanian collections. Besides differing from *M. occidentalis* in fruit form and from *M. vernicosa* in leaf texture, the Hagen collections are from a higher altitude than any known locality of either *M. vernicosa* or *M. occidentalis* and have leaf undersurfaces with contrastingly light-drying main veins unlike any specimen of either species. Pending additional collections, including flowering material, I prefer not to describe this probably new, but not very distinctive, species.

Chromosome number: 2n = 32.

a. Leaves very large, more than 30 cm long.
  b. Leaves densely and persistently pubescent over surface beneath, obovate ---------- 11. *M. schlimii*
  bb. Leaves glabrous beneath or with a few trichomes along midveins, linear to oblanceolate.
    c. Leaves linear to linear oblanceolate, less than 8 cm wide, strongly bullate; inflorescence terminal ---------- 9. *M. linearifolia*
    cc. Leaves oblanceolate, more than 10 cm wide, slightly or not at all bullate; inflorescence cauliflorous ---------- 4. *M. donnellsmithii*
aa. Leaves small to medium large, less than 33 cm long.
  d. Leaf bases cordate ---------- 3. *M. cordata*
  dd. Leaf bases cuneate to obtuse or subrounded.
    e. Petiole less than 3.5 cm long; leaves with fewer than 15 pairs of secondary veins; stems not hollow.
      f. Fruits less than 1 cm diam., globose; inflorescence terminal or from uppermost leaf axils, the individual flowers pedicellate; outer petals ca. 1 mm long; above 1300 m alt. ---------- 8. *M. idiopoda*
      ff. Fruits more than 1.5 cm long, obovoid to pyriform; inflorescence usually

ramiflorous with subsessile flowers, if from axils of extant leaves then the outer petals 3–6 mm long; mostly sea level to middle elevations.

g. Flowers mostly pedicellate, relatively large, the outer petals 3–6 mm long; inflorescence from upper leaf axils.
  h. Petals 5–6 mm long; twigs and petioles glabrous; leaves glabrous ---------- 7. *M. grandiflora*
  hh. Petals 3–5 mm long; twigs and petioles villous; leaves hirsute at least on main veins ---------- 2. *M. brenesii*

gg. Flowers subsessile, the outer petals less than 3 mm long; inflorescence usually ramiflorous.
  i. Leaves glabrous, petiole glabrous or soon glabrescent.
    j. Leaves chartaceous, secondary veins plane above, base cuneate ---------- 6. *M. glabrata*
    jj. Leaves thick coriaceous, secondary veins impressed above, base truncate ---------- 5. *M. frondosa*
  ii. Leaves persistently puberulous at least along veins beneath and on petiole.
    k. Inflorescence very dense at anthesis; leaves coriaceous; middle elevations ---------- 12. *M. vernicosa*
    kk. Inflorescence not dense, adjacent flowers usually separated by at least 1 mm; leaves chartaceous; low to middle elevations ---------- 10. *M. occidentalis*

ee. Petiole 4–9 cm long; leaves with mostly 13–22 pairs of secondary veins; stems hollow ---------- 1. *M. allenii*

1. **Meliosma allenii** Standley & L. O. Williams, Ceiba 3: 213. 1953. Nom. nov. for *M. maxima* Standley & L. O. Williams.

M. maxima Standley & L. O. Williams, Ceiba 1: 242. 1951. TYPE: Costa Rica, Puntarenas, Palmar Norte, *Allen 5648* (F, holotype; F, US, isotypes), non Standley & Steyermark, 1944.

M. longipetiolata Standley & L. O. Williams ex Brizicky, Trop. Woods 110: 39. 1959. TYPE: Costa Rica, Puntarenas, near Palmar Norte, *Allen 5648* (US, holotype; F. MO, isotypes).

Tree 10–15 m tall; branchlets sparsely appressed puberulous when young, glabrate, hollow, smooth, essentially elenticellate though often with large elliptic light-drying lenticel-like spots. *Leaves* alternate, 13–33 cm long, 3.5–14 cm wide, narrowly oblong-elliptic to oblong-obovate, briefly acuminate to acute, cuneate at the base, chartaceous, entire, drying darker above, the veins plane above, the midveins and the lateral veins prominent below, the lateral veins (11–)13–22 on a side, straight and strongly ascending, the tertiary venation prominulous below, minutely punctate above and below, glabrous or with a few inconspicuous subappressed trichomes along the main veins below, the petiole minutely puberulous, 4–9 cm long. *Inflorescence* arising from the leaf axils or below the leaves on young branches, puberulous, pyramidal-paniculate, the sessile flowers clustered on short-axised fascicles along the subspicate lateral branches. *Flowers* with 5 sepals, subequal, suborbicular, ciliate, sparsely appressed-puberulous, ca. 1 mm long; outer petals 3, greenish yellow to yellow orange, drying blackish, broadly ovate, the apex rounded, 1.5–1.8 mm long and wide, the narrow margin thinner, the inner petals smaller, narrow; stamens 2, the anther thecae thick and suborbicular, 0.2 mm long, separated by the broad connective the staminodes 3; ovary ovoid, glabrous, ca. 0.8 mm long, apically merging with the style. *Fruit* obovoid-globose, glabrous, single-seeded, ca. 2 cm long, 1.5–2 cm in diam., subsessile on a short thick pedicel.

This species occurs on the Osa Peninsula and Golfo Dulce area of southeastern

Costa Rica and adjacent Panama. A closely related similarly long-petiolate plant occurs in Amazonian Peru and may be conspecific.

Meliosma allenii was described (as *M. maxima*) from fruiting material; *M. longipetiolata* from flowering material. The main difference cited by Brizicky in separating *M. longipetiolata* from *M. allenii* was its more numerous lateral nerves (18–22 per side versus 15). This is a manifestly variable character: one isotype of *M. allenii* has up to 17 pairs of lateral nerves, while some leaves of the MO isotype of *M. longipetiolata* have as few as 16 pairs of lateral nerves. The main diagnostic feature of *M. allenii* is the unusually long petiole.

CHIRIQUÍ: 11 mi W of Puerto Armuelles, San Bartolo Limite, 100–500 m, *Liesner 74* (MO). Between Cañazo and Cocos, near Puerto Armuelles, *Stern & Chambers 145* (F, MO, NY).

2. **Meliosma brenesii** Standley, Field Mus. Nat. Hist., Bot. Ser. 18: 648. 1937. TYPE: Costa Rica, Alajuela, La Palma de San Ramon, 1,050 m, *Brenes 5556* (F, holotype; NY, isotype).

Small to medium-sized *tree* 3–10 m tall; branchlets subterete, villous with reddish-brown trichomes, densely so when young, longitudinally striate. *Leaves* alternate, 9–27 cm long, 3–6 cm wide, oblanceolate or oblong oblanceolate, acuminate, cuneate at the base, chartaceous, subentire to slightly and remotely serrate, drying dark olive gray above, olive with tannish main veins below, the lateral veins 12–15 on a side, the tertiary venation prominulous below and plane above, densely hirsute along the main vein above, less pubescent and glabrescent over the surface, below hirsute along the main veins, sparsely pubescent and glabrescent over the surface, more or less inconspicuously lepidote; petiole 0.3–1 cm long, reddish hirsute. *Inflorescence* axillary, narrowly paniculate or almost racemose, the rachis rufous-hirsute, the flowers subsessile or with pedicels up to 3 mm long on 1-flowered secondary branches. *Flowers* with 4 sepals, broadly ovate, ca. 2 mm long and 3 mm wide, ciliate; outer petals white, falling explosively at anthesis (fide collector), suborbicular, 3–5 mm in diam., minutely ciliate, thinner only at extreme edge; stamens 2, the strap-shaped filaments 1.5–2 mm long, the basal appendages (reduced inner petals) also 1.5–2 mm long, the thecae thick, suborbicular, ca. 0.6 mm long, apically proximate, basally widely separated by the thickened connective; ovary conical, ca. 1 mm long, apically merging with the ca. 2 mm long style. *Fruit* subglobose, 1.8–2 cm in diam.

This species is known only from two collections, the Costa Rican type and the single Panamanian collection cited below.

Meliosma brenesii is characterized by the largest flowers of any Panamanian *Meliosma* except very different *M. grandiflora*. The narrow leaves and reddish villous twigs are also useful characters.

One Panamanian fruiting collection may also be related to *M. brenesii*. This is *Folsom and Collins 6508* (MO) from Alto Calvario, 7 km N of El Cope, Coclé Province, 700–850 m, which is vegetatively similar to *M. brenesii* but has smaller (1.5 cm long, 1.5 cm diam.) more strongly keeled and asymmetric fruits and is less densely pubescent. If not referrable to *M. brenesii*, the Folsom collection represents an undescribed species.

CHIRIQUÍ: 3–5 mi NE of Boquete, end of road along Río Palo Alto, *Hammel 5664* (MO).

3. **Meliosma cordata** A. Gentry.[4] TYPE: Panama, *Mori 6297* (MO, holotype).

Tree 3–6 m tall; branchlets persistently puberulous with erect trichomes, eventually glabrate, the old twigs with large widely scattered pale corky lenticels. *Leaves* frequently opposite, always in part alternate, 5–20 cm long, 2–8.5 cm wide, oblong-ovate to oblong-obovate, acute to acuminate, broadly shallowly cordate at the base, chartaceous, entire or with a few coarse teeth near the apex, drying dark above, olive brown with darker brown main veins below, the midvein impressed above and raised below, the lateral veins plane above and prominent below, the tertiary venation prominulous below, densely minutely punctate above, glabrous except for a few trichomes along the main veins; petiole (1–)2.5–6 cm long, puberulous. *Inflorescence* cauliflorous or ramiflorous, openly pyramidal paniculate, puberulous with erect trichomes, 14–25 cm long, the flowers on pedicels ca. 2 mm long. *Flowers* with the sepals 5, ovate, the tip rounded, ciliate, also sparsely puberulous; petals and stamens not seen; ovary ovoid, ca. 1 mm long, the style ca. 1 mm long. *Fruit* (immature) obovoid, to at least 1.5 cm long and 1 cm wide, white turning purple when fresh.

Meliosma cordata is known only from intermediate altitudes on the slopes of Cerro Tute above Santa Fé.

This species is distinctive on account of its long-petiolate, conspicuously cordate leaves. The only other species which resembles *M. cordata* in leaf form is *M. seleriana* Urb. of Guatemala and Chiapas, Mexico. *Meliosma seleriana* differs in longer narrower glabrous leaves, smaller (ca. 5 mm diam.) globose fruits, and having the inflorescences from the leaf axils or just below the leaves. One Costa Rican species, *M. subcordata* Standl., has the leaf base cordate but is very different in its short thick petioles and the narrowly oblong-obovate leaf shape gradually tapering to a narrowly cordate base; the inflorescences of *M. subcordata* are terminal or in the axils of the uppermost leaves and that species has larger fruits 2 cm in diam.

VERAGUAS: lower slopes of Cerro Tute, ca. 10 km NW of Santa Fé, 750–1000 m, *Mori 6297* (MO).

4. **Meliosma donnellsmithii** Urb., Bot. Gaz. 37: 214. 1904. TYPE: Costa Rica, Cartago, 500 m, *Donnell Smith 6852* (US, holotype; NY, US, isotypes).

Small *tree* 3–8 m tall; branchlets not seen. *Leaves* large, oblanceolate, 30–54 cm long, 10–15 cm wide, abruptly short acuminate, tapering gradually toward the base, the extreme base auriculately rounded, entire to remotely and inconspicuously serrate toward the apex, drying dark olive below, darker above, the main veins plane or somewhat impressed above, prominent below, the lateral veins 19–23 on a side, tertiary venation prominulous below, minutely punctate, glabrous

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[4] *Meliosma cordata* A. Gentry, spec. nov. Arbor parva. Folia simplicia, interdum ex parte opposita, oblongo-ovata vel oblongo-obovata, late cordata, glabrata. Inflorescentia cauliflora vel ramiflora, pyramidale paniculata, floribus pedicellatis. Sepala 5, ovata; ovario ovoido. Fructus (immaturus) obovoideus, minimum 1.5 cm longus.

except for a few appressed trichomes along the midvein; petiole lacking or short and thick, 0.4–1 cm long, appressed puberulous. *Inflorescence* cauliflorous, openly paniculate, to 25 cm long, appressed puberulous, the flowers subsessile on the ultimate third or fourth order branches. *Flowers* with the sepal suborbicular, the apex rounded, ciliate, otherwise glabrous, 1 mm long and wide; outer petals broadly ovate, erose but not ciliate, ca. 1.5 mm long, ca. 2 mm wide, the interior petals narrow; fertile stamens 2, with linear filaments ca. 1 mm long, the anther thecae orbicular, ca. 0.2 mm long; ovary ovoid, glabrous, the apex contracted into the base of the style, the stigma briefly 2-lobed. *Fruit* obovoid-globose, 1.5–2 cm long and wide, glabrous.

Although not yet found in Panama, *Meliosma donnellsmithii* occurs in the Atlantic coastal lowlands and the Osa Peninsula of Costa Rica; thus it is to be expected both in Bocas del Toro and the Burica Peninsula in Panama.

This species is unique among the Central American species of *Meliosma* in its large subsessile leaves with more or less auriculate bases. The plant is strikingly reminiscent of such pachycaulous species of Lecythidaceae as *Gustavia superba*.

A related but apparently undescribed species with similar large, but non-auriculate leaves, a terminal more open inflorescence, and pedicellate flowers occurs on the Osa Peninsula of Costa Rica.

5. **Meliosma frondosa** Cuatr. & Idrobo, Caldasia 7: 193. 1955. TYPE: Colombia, Cundinamarca, 1,900–2,100 m, *Idrobo & Hernández 1532* (COL, holotype; F, US, isotypes).

Tree 8–10 m tall; branchlets longitudinally finely striate, glabrous or inconspicuously minutely appressed-puberulous. *Leaves* elliptic-oblong, 4–16(–42) cm long, 2.3–6(–15) cm wide, rounded at base and apex, thick-coriaceous, the margin entire, somewhat involute, drying gray above, brown below, the midvein and secondary veins impressed above and raised below (the Panamanian collection strikingly bullate), secondary veins 8–11 on a side, tertiary venation plane above and slightly prominulous below, glabrous (a few tiny adpressed, essentially invisible hairs along midvein of type); petiole 1–2 cm long, glabrous. *Inflorescences* paniculate from axils of the upper leaves, puberulous, the individual flowers sessile, densely congested on the ultimate branches, subtended by sepal-like bracteoles. *Flowers* white, drying black; sepals orbicular, long-ciliate, 1–2 mm long (–2.6 mm fide Cuatrecases & Idrobo), outer petals suborbicular, ca. 1 mm long (in bud); stamens 2, the anther thecae short and thick; ovary not seen. *Fruit* asymmetrically pryiform, 1.6–2 cm long, 1.4–1.6 cm wide.

This description of *M. frondosa* is taken from the Colombian type and two other collections, one from Ecuador (Bolivar Province, 2,800 m, *Acosta Solis 6851*, F) and one from Panama, which seem to match it. The Panamanian collection, from cloud forest (lower montane rain forest) above 1,000 m altitude, has more strikingly bullate leaves than the two South American collections, but is otherwise a reasonable match with this species.

VERAGUAS: Cerro Tute, ridgetop in cloud forest, 10 km NW of Santa Fé, *Mori 6753* (MO).

6. **Meliosma glabrata** (Liebm.) Urb., Ber. Deutsch. Bot. Ges. 13: 212. 1895.

Lorenzanea glabrata Liebm., Vidensk. Meddel. Danske Naturhist Kjbenhavn 1850: 71. 1850. TYPE: Costa Rica, Turrialba, *Oersted* (F-1999A; F. neg. 13373).
L. ira Liebm., Vidensk. Meddel. Dansk Naturhist Kjøbenhavn 1850: 71. 1850. TYPE: Costa Rica, Naranjo, *Oersted* (not seen).
Meliosma tonduzii Donnell Smith, Bot. Gaz. 55: 432. 1913. TYPE: Costa Rica, Tucurrique, 635–700 m, *Tonduz 13368* (US, holotype; US, isotype).
M. panamensis Standley, Trop. Woods 10: 49. 1927. TYPE: Panama, *Cooper & Slater 29* (US, holotype; F, NY, isotypes).
M. ira (Liebm.) L. O. Williams, Fieldiana, Bot. 31: 261. 1967.

Tree 7–11 m tall, 15–30 cm d.b.h.; branchlets completely glabrous or with a few inconspicuous minute trichomes when very young. *Leaves* narrowly elliptic to oblong-obovate, 6.5–20(–32) cm long, 2–7.5(–11) cm wide, acute to short-acuminate, cuneate at the base, chartaceous, entire or with a few remote teeth toward the apex, drying dark above, olive below, the main veins drying reddish brown below, the midvein impressed above, raised below, the secondary veins plane above and prominent below, 10–12(–13) on a side, tertiary venation prominulous below, glabrous; petiole glabrous, 1–3(–3.5) cm long. *Inflorescence* arising from branchlets below the leaves, paniculate, subappressed puberulous, 9–16 cm long, the individual flowers subsessile or the pedicels less than 1 mm long. *Flowers* white, drying black; sepals suborbicular, ciliate-fringed, otherwise glabrous, 1 mm long; outer petals narrowly ovate, thick, not thinner at the margins, the apex obtuse, 2.5–3 mm long, 2 mm wide, the inner petals thin, linear, 2 mm long; stamens 2, the narrow filaments ca. 1 mm long, the anther thecae short, thick, ca. 0.4 mm long, widely separated by the broad connective; ovary ellipsoid, glabrous, ca. 0.8 mm long, apically tapering to the 1.5–2 mm long style, the stigma usually minutely bilobed; disc obsolete. *Fruit* pyriform-globose, 1.5–2.5 cm long, 1.5–2 cm in diam.

Meliosma glabrata occurs at low and intermediate altitudes in Panama (to 900 m) and Costa Rica (below 1,500 m). It is also reported by Cuatrecasas from coastal Colombia, probably ranging to western Ecuador where *M. littlei* Cuatrecasas seems inadequately distinguished.

The Ecuadorian plant treated as *M. panamensis* in the Flora of Río Palenque is actually *M. occidentalis*, as here interpreted, and the chromosome count for that species of 2n = 32 should be referred to *M. occidentalis* (see Goldblatt, 1979).

Meliosma panamensis was described from lowland material which differs from *M. glabrata* only in its more conspicuously serrate, frequently slightly larger leaves. Leaf serration is too variable in this group to be accepted as the sole criterion for species recognition: most more or less topotypic material of *M. panamensis* has completely or essentially entire leaves and one leaf of the NY isotype is virtually entire. Only *Wedel 710* matches the conspicuously serrate leaves described for *M. panamensis*. Probably Standley's description of the lowland Panamanian entity as new resulted from his misapplication (following Urban) of *M. glabrata* to the smaller-leaved upland species discussed above as *M. ira*.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 29* (F, NY). Almirante, *Cooper 379* (F, NY), *565* (F, NY). Water Valley, *Wedel 710* (F, MO). Río Teribe, 400–800 ft, *Kirkbride & Duke 492*

(MO). COCLÉ: La Mesa, 2500 ft, *Dwyer & Duke 8252* (F, MO). El Valle, 600 m, *Lao 275* (MO). 3 km NE of El Valle, *Mori & Kallunki 2972* (MO).

7. **Meliosma grandiflora** Morton ex A. Gentry, spec. nov.[5] TYPE: Costa Rica, San José, vicinity of El General, 730 m, *Skutch 4049* (MO, holotype).—FIG. 1C–D.

Tree 10 m tall; branchlets subterete, glabrous, drying tan. *Leaves* alternate, 5–13 cm long, 2–4.7 cm wide, oblong-elliptic to obovate-elliptic, acute to acuminate, cuneate at the base, chartaceous to coriaceous, entire, drying dark brown above, brown beneath, the lateral veins 6–10 on a side, not clearly differentiated from tertiary venation, the tertiary venation intricately prominulous below, more or less plane above, densely minutely lepidote-punctate above, glabrous, the petiole slender, 1–2 cm long, glabrous. *Inflorescence* a narrow open axillary panicle, ca. 8–12 cm long, appressed puberulous, the flowers fewer than 14, on 1.5–3 mm long pedicels. *Flowers* very large for the family, 5 mm long in bud; sepals 5, orbicular, 2 mm in diam., ciliate-fringed, otherwise glabrous, subtended by several progressively smaller bracteoles resembling additional sepals; outer petals white, turning pale orange, suborbicular, 5–6 mm long and wide, the margins not noticeably thinner, not at all or sparsely ciliate; stamens 2, exceeded by the attached basal appendages, the thecae thick, suborbicular, 1 mm long; ovary narrowly conical, glabrous, 1 mm long, apically merging with the 2.5–3 mm long style. *Fruit* obovoid-pyriform, 2–2.5 cm long, 1.6–1.9 cm wide.

The type specimen is marked "*Meliosma grandiflora* Morton, n.sp., cotype" but that name was never published. The species is a distinctive one, having by far the largest flowers in the genus and apparently in the family as well. Vegetatively it is characterized by the small leaves with thin proportionally long petioles and intricately sculpted upper leaf surface. It is known from middle elevation wet forests on the Pacific slope of the central Cordillera between 700 and 1,100 m altitude. The Coclé Province specimen cited below may not be conspecific with the Costa Rican collections [type and COSTA RICA: Puntarenas: 1 mi S of San Vito de Java (just across Panamanian border), *Raven 21914* (F, MO).] and is not included in the description. It differs in having leaves with less prominulous tertiary venation beneath and a smaller (but possibly immature) much more strongly keeled and asymmetric fruit.

COCLÉ: 4 km N of El Valle, 875 m, *Nee & Dwyer 9175* (MO).

8. **Meliosma idiopoda** Blake, J. Wash. Acad. Sci. 14: 289. 1924. TYPE: Costa Rica, Tucurrique, 635–700 m, *Tonduz 13372* (US).

M. dives Standley & Steyermark, Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 60. 1944. TYPE: Guatemala, Suchitepéquez, 1250 m, *Steyermark 46773* (F).

Shrub or *tree* 2–13 m tall, the branchlets terete, glabrous, longitudinally

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[5] *Meliosma grandiflora* Morton ex Gentry, spec. nov. Arbor. Folia simplicia, oblongo-elliptica vel obovato-elliptica, cuneata, glabra. Inflorescentia axillaris, paniculata, floribus amplis, pedicellatis. Fructus obovoideo-pyriformis, 2–2.5 cm longus.

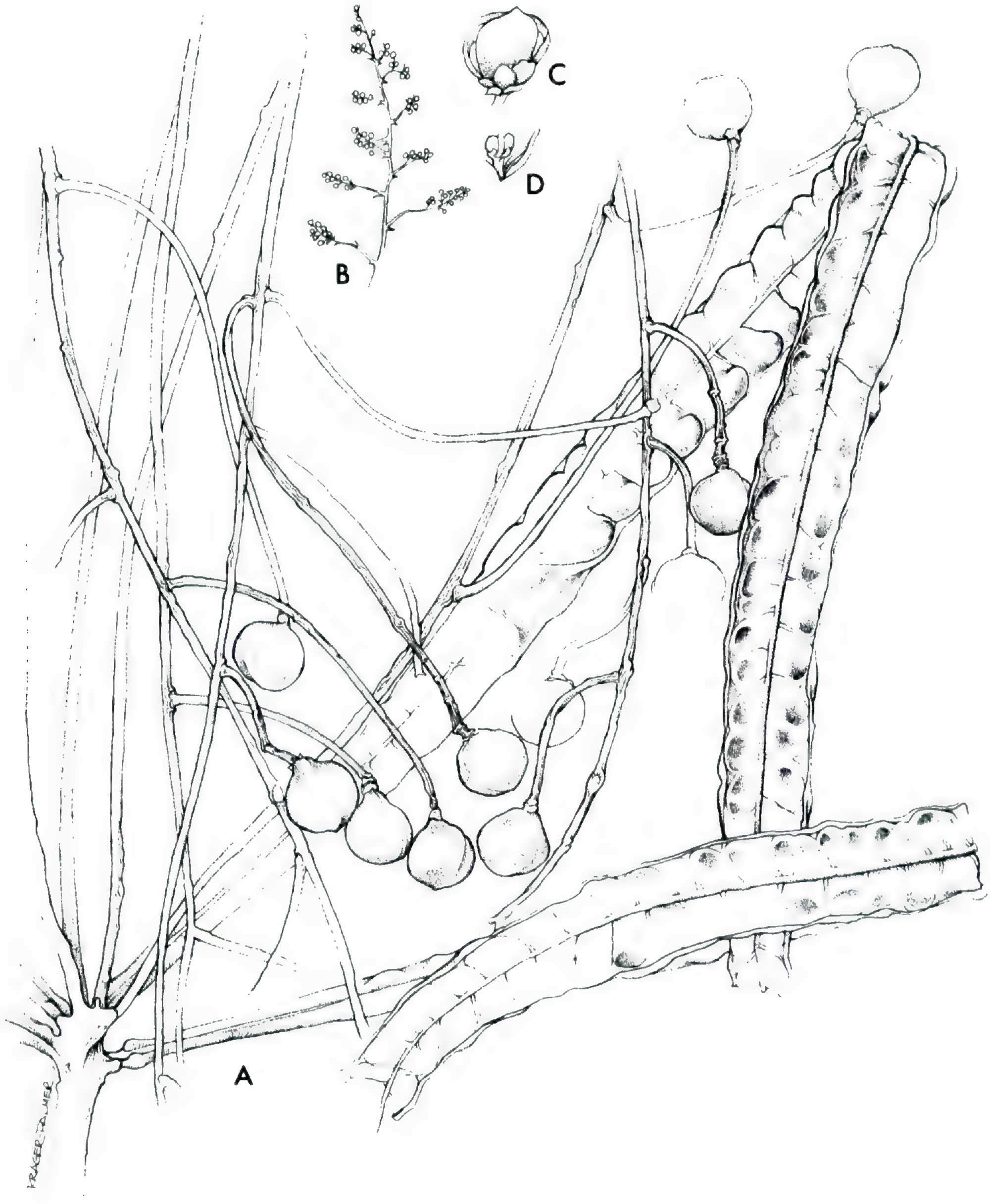

FIGURE 1. *Meliosma*.—A–B. *Meliosma linearifolia* A. Gentry.—A. Habit and fruiting inflorescence (×½). [After *Mori & Crosby 6335* (MO).]—B. Part of inflorescence (×2). [After *Correa & Dressler 1148* (MO).]—C–D. *M. grandiflora* A. Gentry.—C. Flower (×3).—D. Stamen and inner petal (×3). [After *Skutch 4049* (MO).]

striate. *Leaves* alternate, 8.5–17 cm long, 2–5.5 cm wide, obovate to narrowly elliptic, acuminate, attenuate at the base, chartaceous to coriaceous; entire to conspicuously remotely serrate, drying dark green or olive, the venation lighter beneath, the veins plane above, the main veins prominent beneath, the lateral nerves 8–10(–12) on a side, the surface minutely punctate, glabrous except for

conspicuous simple trichomes in the axils of the lateral nerves beneath, the slender petiole indistinctly demarcated from the leaf base, ca. 0.5–2 cm long. *Inflorescence* an open panicle, terminal or from the uppermost leaf axils, usually ca. 20 cm long, sparsely puberulous with short gland-tipped trichomes and longer eglandular trichomes, the flowers on pedicels mostly ca. 2 mm long. *Flowers* white; sepals ovate, ciliate, otherwise glabrous, 1–1.2 mm long; outer petals transversely oblong, much broader than long, ca. 1 mm long, 1.5 mm wide, the inner petals smaller; stamens with filaments shorter than the anthers, ca. 0.5 mm long, the thecae large, contiguous, ca. 0.6 mm long; ovary ovoid, ca. 1 mm long, the base surrounded by a cupular disc, glabrous or the apex more or less puberulous, contracted into the base of the 1 mm long style, the stigma undivided. *Fruit* globose, 0.6–0.8 cm in diam., turning reddish at maturity.

This species ranges from extreme southern Mexico to Panama where it occurs from 1,300 to 2,500 m in wet montane forests.

This common montane species was treated by Williams (1967) as *M. ira*. I have been unable to discover on what basis he related this small-fruited small-leaved species to *M. ira* which previously had been referred, apparently correctly, to the synonymy of *M. glabrata* by Urban and Standley. Since the fruits of *Lorenzanea ira* were described as 9 lines (ca. 2 cm) long and 7 lines wide, that name cannot possibly be applied to this plant with fruits less than 1 cm long. Only four neotropical species of *Meliosma* have the small fruits of the montane Costa Rica/Chiriquí species. *Meliosma alba* differs greatly in its compound leaves and *M. dentata* (Liebm.) Urb. in its larger flowers and slightly larger fruits (1 cm long). *Meliosma dives* Standley and Steyermark and *M. matudae* Lundell are known only from Guatemala and adjacent Chiapas, but both are very similar to the plant of Costa Rica and Panama. The only extant flowering specimen of *M. dives* at F, the type, differs from *M. idiopoda* in shorter thicker pedicels and a slightly more contracted inflorescence but I question whether this justifies specific segregation. The only flowering collections of *M. matudae* I have examined, both from Chiapas, are *Matuda 2045* (F) and *Breedlove 8961* (F), the second of these originally reported by Williams (1967) as *M. dives*. This collection has the narrower more coriaceous leaves and long (1.5–3 mm) pedicels of typical *M. matudae*. It is possible that *M. matudae* like *M. dives*, should be reduced to the synonymy of *M. idiopoda*, of which it seems merely a thick-leaved form, especially since both leaf types occur in Panama. Of the collections cited here, *Lao 390*, is especially like *M. matudae* on the basis of fruit size and small coriaceous leaves. The other Panamanian and Costa Rican collections are intermediate between the two Guatemalan species, having slightly smaller flowers and thinner leaves than *M. matudae* but distinctly longer pedicels than the type of *M. dives*. The unresolved taxonomic problem in Guatemala should not affect the Panamanian nomenclature since the Costa Rican name is older than either of the others.

CHIRIQUÍ: Volcán Barú, 10 mi from Boquete, 2500 m, *Croat 34984* (MO). Palo Santo, 3 mi N of Volcán, *Croat 3600, 13602* (both MO). Cerro Punta, 2000 m, *Lao 390* (MO). Santa Clara region, 27 km NW of El Hato del Volcán, 5000–5300 ft, *Mori & Bolten 7204* (MO). Finca Las Alturas, Cotón, 1300 m, *Croat 44353* (MO). Cerro Pando, *Croat 15982* (MO).

9. **Meliosma linearifolia** A. Gentry.[6] TYPE: Panama, *Correa & Dressler 1148* (MO, holotype).—FIG. 1A–B.

Pachycaul *tree* 4–15 m tall, 4 cm d.b.h.; branchlets thick, somewhat angular, minutely puberulous, soon glabrate, elenticellate. *Leaves* alternate, clustered at the branch tips, 40–60 cm long, 2.5–7.5 cm wide, linear to narrowly oblanceolate, apices not seen, basally gradually attenuate, usually more or less auriculate at the extreme base, entire, coriaceous, strikingly bullate, the main veins impressed above and raised below, the surface densely minutely punctate, puberulous with minute, mostly gland-tipped trichomes along the veins and sparsely over the surface below and sometimes above; petiole puberulous, in part with gland-tipped trichomes, usually thick and less than 1 cm long, to 3 cm long on young branchlets. *Inflorescence* a large open terminal panicle 40–70 cm long, puberulous with erect reddish trichomes in part gland-tipped, the flowers with individual pedicels mostly ca. 1 mm long. *Flowers* cream with brown calyces; sepals 5, subequal, suborbicular, ca. 1 mm long, long ciliate, also with a few scattered simple trichomes and stalked glands; 3 outer petals broadly ovate, entire, ca. 1.5 mm long and 1.2 mm wide, with a broad thinner margin; fertile stamens 2, ca. 1 mm long, the anther thecae ovoid, contiguous at the middle but the bases separated by the thickened connective, the filament broad and strap-shaped; ovary ovoid-globose, ca. 0.6 mm long, the stigma short, ca. 0.1 mm long. *Fruit* pyriform-globose, 1.5–1.8 cm long, 1.5–1.7 cm wide, glabrous.

This species is known only from Central Panama. It is easily the most distinctive species of *Meliosma* on account of its strikingly linear bullate leaves. The species is locally fairly common in sterile condition on Cerro Jefe but I have never seen it in the field in flower or fruit.

COLÓN: Santa Rita Ridge trail, beyond end of Santa Rita Ridge Road, 17–35 km from Boyd-Roosevelt Highway 400–800 m, *Mori & Crosby 6335* (MO). PANAMÁ: NE of Cerro Azul, 20 km by road from Panamerican Highway, *Mori & Kallunki 3647* (MO).

10. **Meliosma occidentalis** Cuatr., Lloydia 11: 217. 1948. TYPE: Colombia, Valle, Río Anchicayá, 230–260 m, *Cuatrecasas 15279* (F, holotype; COL, US, isotypes).

Tree 6–20 m tall; branchlets appressed puberulous when young, glabrescent, terete. *Leaves* elliptic to narrowly obovate, 6–26 cm long, 2.5–10.5 cm wide, acute to acuminate, cuneate to obtuse at the base, chartaceous, entire or with a few remote teeth towards the apex, drying dark above, brownish below, the midvein slightly impressed above, raised below, the secondary veins plane above and prominent below, tertiary venation prominulous below; puberulous on midvein above, below puberulous along the main veins and sometimes sparsely over the surface; petiole more or less puberulous, 1–3.5 cm long. *Inflorescence* arising from the branchlets below the leaves, paniculate, puberulous, 8–18 cm long, the flowers on short, ca. 1 mm long, pedicels or subsessile, mostly borne singly.

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[6] *Meliosma linearifolia* A. Gentry, spec. nov. Arbor vix ramosa. Folia terminale fasciculata, linearia vel anguste oblanceolata, bullata. Inflorescentia terminales, paniculata. Flores sepalis 5, suborbicularis, ovario ovoideo-globoso. Fructus pyriformi-globosus, 1.5–1.8 cm longus.

Flowers white or greenish, drying black; sepals broadly ovate, ciliate fringed, otherwise glabrous, 1 mm long; outer petals ovate, thick, ca. 2.5 mm long, the inner petals linear; fertile stamens 2, the filaments linear, the anther thecae broad, ca. 0.5 mm long, separated by the thickened connective; ovary ovoid, glabrous, ca. 0.8 mm long, apically truncate, the style 2 mm long. *Fruit* pyriform, 2.2–2.5 cm long, 1.7–2 cm wide.

Meliosma occidentalis ranges from Panama to western Ecuador.

This species is similar to *M. glabrata* and its segregate *M. panamensis*. Much of the Panamanian material previously determined as *M. panamensis* is actually this species. The major differentiating feature between the two species is the persistent pubescence of petiole and main veins of the leaf undersurface in *M. occidentalis*. As here interpreted the fruit shape characters noted by Cuatrecasas are not constant.

COCLÉ: La Mesa, 800–900 m, *Croat 37400* (MO); *Gentry 7428* (MO); *Spellman et al. 561* (MO), *580* (MO). El Valle, *Duke 13158* (MO). CHIRIQUÍ: Cerro Horqueta, 6000 ft, *Hagen & Hagen 2112* (MO), 6500 ft, *Hagen & Hagen 2118* (MO). DARIEŃ: Puerto St. Dorotea, *Dwyer 2217* (MO).

11. **Meliosma schlimii** (Turcz.) Triana, Ann. Sci. Nat. Bot. Sér. 5. 16: 363. 1872.

Oligostemon schlimii Turcz., Bull. Soc. Nat. Mosc. 31: 447. 1858. TYPE: Colombia, Norte de Santander, 5000 ft, *Schlim 702* (not seen; F, fragm., F Neg. 23600).

Tree 6–12 m tall; branchlets puberulous with erect trichomes when young, glabrate, longitudinally ridged. *Leaves* alternate, narrowly obovate, 34–60 cm long, 9–18 cm wide, abruptly acuminate to caudate acuminate (cuspidate in type), the base narrowly cuneate to attenuate, thin coriaceous, entire, drying brown below from the pubescence, darker brownish gray above, main veins impressed above and raised below, tertiary venation plane above, prominulous below, above sparsely and glabrescently puberulous over the surface and densely and persistently pubescent on midvein; below strongly and persistently brownish puberulous throughout, the trichomes concentrated along the veins and veinlets; petiole 2–3 cm long, thick, grooved adaxially, puberulous. *Inflorescences* arising from the axils of the uppermost leaves, puberulous, openly paniculate, the flowers congested and sessile on contracted short third order branches, more or less fasciculate. *Flowers* with buds cream, drying blackish; sepals apparently 6, broadly ovate to obtusely subtriangular, the apex acutish, ca. 2 mm long, puberulous. *Fruits* obovoid-globose, 2.3–2.5 cm long, 1.8–2.2 cm in diam.

Meliosma schlimii occurs from Colombia to Costa Rica between 400 and 1,500 m. It is apparently restricted to premontane wet forest.

Meliosma schlimii is distinctive among Panamanian species on account of the large leaves which are persistently softly pubesent below.

Meliosma maxima Standley & Steyermark of Guatemala known only from the type, and a second sheet from the type locality is perhaps inadequately separated by its abruptly rounded leaf base, inconspicuously puberulous young branches, and reduced indumentum of the leaf undersurface. *Meliosma grandifolia* (Liebm.) Urb., of southern Mexico to Nicaragua is also closely related but has smaller more abruptly cuneate leaves and slender merely puberulous twigs.

COCLÉ: Río San Juan above Rió Tife, 1200 ft, *Hammel 3450* (MO). COLÓN: Santa Rita Ridge trail, beyond end of Santa Rita Ridge road, 17–35 km from Boyd Roosevelt Highway, 400–800 m, *Mori & Crosby 6411* (MO). PANAMÁ: Cerro Jefe near Rió Indio, 2100–2200 ft, *Duke 15213* (MO).

12. **Meliosma vernicosa** (Liebm.) Griseb., Cat. Pl. Cub. 47. 1866.

Lorenzanea vernicosa Liebm., Vidensk. Meddel. Dansk Naturhist. Kjøebenhavn 72. 1850. TYPE: Costa Rica, Naranjo, *Oersted* (not seen; F neg. 13379).

Tree 7–12 m tall; young branchlets densely and persistently subappressed-puberulous, eventually glabrate. *Leaves* alternate, 11–19 cm long, 6–9 cm wide, elliptic to obovate-elliptic, obtuse or acute to shortly and abruptly acuminate, broadly cuneate to rounded at the base, coriaceous, entire to remotely and inconspicuously serrate, drying brownish olive below, darker above, the midvein impressed above, raised below, lateral veins plane or impressed above, prominent below, tertiary venation prominulous below, puberulous above and below, glabrescent except along the main veins below; petiole 1–2.5 cm long, puberulous. *Inflorescence* arising from the branchlets below the leaves, pyramidal-paniculate, the sessile flowers densely congested along second order and/or third order branchlets. *Flowers* greenish; sepals suborbicular, the margins erose-ciliate, otherwise glabrous, ca. 1 mm long; outer petals drying blackish, triangular-ovate, the apex obtuse, ca. 2 mm long, ca. 2 mm wide, the narrow margin thinner, the inner petals narrow; stamens 2, the anther thecae thick, subglobose, ca. 2 mm long, widely separated by the thickened connective; ovary ovoid, ca. 0.5 mm long, the style 1–1.2 long, the stigma undivided; disc obsolete. *Fruit* obovoid-globose, 2.2–2.5 cm long, 1.8–2 cm wide, the surface broadly wrinkled when dry.

PANAMÁ: Cerro Campana, 850 m, *Liesner 610* (MO). VERAGUAS: 1 km from Escuela Agricola Alto de Piedra NW of Santa Fé, *Mori & Kallunki 4884* (MO).

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FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part VI

FAMILY 121A. QUIINACEAE

W. G. D'ARCY[2]

Trees or *shrubs*, sometimes clambering; phloem with copious mucilage. *Leaves* opposite or verticillate, simple, entire, serrate or lobed, sometimes on the same plant, often coriaceous, often with a characteristic satiny sheen; stipules entire or lobed. *Inflorescences* of small clusters of axillary dichasia or of terminal spikes or racemes; bracts and sometimes bracteoles mostly present. *Flowers* small, unisexual or perfect; calyx of 4–5 valvate free sepals; petals 4–8; stamens free or basally united, the filaments short, slender, the stamens sometimes with a broad connective; carpels 2–13, each locule with 2 axile, anatropous ovules, the styles free. *Fruit* baccate, globose, often 1 locular; putamen hard, sometimes dehiscent; seeds mostly several-numerous, felty tomentose; embryo straight with a short hypocotyl and thick cotyledons.

The Quiinaceae includes about 4 genera with about 50 species, all in South America except for 2 or 3 species in Central America and the Antilles.

This family is similar in some respects to the Guttiferae but differs in its wood anatomy, in having a different kind of mucilaginous or resin duct, and in its hairy seeds. It is often allied with the Theaceae or Cunoniaceae.

1. LACUNARIA

1. **Lacunaria** Ducke, Arch. Jard. Bot. Rio Janeiro 4: 139. 1925. LECTOTYPE: *L. grandiflora* Ducke.[3]

Small glabrate *trees* or *shrubs*, sometimes clambering; phloem with copious mucilage. *Leaves* opposite or verticillate entire, toothed or lobed, sometimes the juveniles with lobed leaves and mature plants with entire or toothed leaves, glabrate with a characteristic satiny sheen; stipules prominent but sometimes early deciduous. *Inflorescences* with flowers perfect or unisexual, short terminal aments or in axillary clusters; flowers bracteate. *Flowers* small, sepals 4–5, persistent; petals 4–8, free; stamens numerous, free or the filaments basally united, the anther thecas separated by a broad connective; carpels 2–13, each locule with 2 axile ovules. *Fruit* baccate, tardily separating into valves, through abortion

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[1] Assisted by National Science Foundation grant DEB 77-04300. (W. G. D'Arcy, principal investigator.)

[2] Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166.

[3] This species is chosen as lectotype as it was given the most attention by Ducke in his description of the genus, and he also had more material of this to study than the other two species described at the same time.

FIGURE 1. *Lacunaria colonensis* D'Arcy—A. Habit (×½).—B. Inflorescence (×2). [After *Mori & Crosby 6314* (MO).]

often 1 locular, 1–3 seeded; seeds felty pubescent, the embryo straight with short hypocotyl and thick cotyledons, endosperm wanting.

Lacunaria is a genus of about a dozen species mainly in South America, especially Argentina and Brazil but extending into Central America.

a. Inflorescences axillary dichasia or solitary flowers clustered to appear fasciculate ---------- 1. *L. colonensis*

aa. Inflorescences terminal aments ---------- 2. *L. panamensis*

1. **Lacunaria colonensis** D'Arcy.[4] TYPE: Panama, *Mori & Crosby 6314* (MO, holotype; PMA, P, isotypes).—FIG. 1.

Tree 9 m tall, 15 cm d.b.h.; twigs terete, drying orange brown, scurfy with microscopic trichomes, soon green; stipules linear, 5–6 mm long, drying reddish, glandular. *Leaves* simple, entire, ovate or obovate, apically acuminate, basally acuminate, basally acute or acuminate, the lateral venation slightly arcuate, parallel, impressed above, elevated beneath, minor venation obscure, under a lens seen to be irregularly whorled, glabrous, slightly discolorous with a velvety sheen; petioles slender, ca. 1 mm long, scurfy puberulent beneath, 12–18 cm long, 4–6 cm wide; stipules not seen. *Inflorescences* of solitary flowers or dichasia in the leaf axils, appearing fasciculate; bracts minute, subulate or cuculate, minutely puberulent, subtending the pedicels; obsolete bracteoles present, seemingly halfway up the pedicels, these bearing a few greatly reduced trichomes. *Flowers* with sepals 4, narrowly obtuse to rounded, persistent, glabrous; petals 4, ca. 3 mm long, rounded, overtopping the stamens in bud; stamens numerous, ca. 43, the filaments drying reddish brown, ca. 1 mm long, the anthers drying white, 4-thecate, 2 of these somewhat reduced; ovary globose, longitudinally striate, the styles 3, ca. 2 mm long.

This species resembles material from Peru and Brazil that goes under the name *L. minor* Ducke, but the inflorescence is much more contracted and much less pubescent. The material referred to as passing for *L. minor* does not accord well with Ducke's description, however, and is perhaps wrongly determined. *Lacunaria colonensis* is strikingly different from the other Panamanian species in its inflorescence. It is known only from Colón Province, Panama.

COLÓN: Salud, 20 m, *Howell 149* (MO). Santa Rita Ridge trail, 17–35 km from Boyd Roosevelt Highway, 400–800 m, *Mori & Crosby 6314* (MO, PMA, P).

2. **Lacunaria panamensis** (Standley) Standley, Ann. Missouri Bot. Gard. 29: 358. 1942.

Quiina panamensis Standl., Trop. Woods 16: 21. 1928 (nomen): Field Mus. Bot. 4: 236. 1929. TYPE: Panama, *Cooper 609* (F).

Small *tree* reaching 15 m, the branches slender, seemingly dioecious. *Leaves* opposite or whorled, ovate, somewhat falcate, apically acute, basally rounded or obtuse, entire, 7–12 cm long, 4–5 cm wide, the lateral venation arcuate, drying conspicuously impressed, minor venation obscure, glabrate, perhaps a few minute hairs along the costa above; petioles short, 3–5 mm long, pubescent beneath; stipules linear, flat, 6–9 mm long. *Inflorescences* short aments clustered in terminal leaf axils, the flowers crowded, the peduncle and the rachis to 15 mm long, hispidulous, drying reddish brown, the bracts narrowly ovate, acute, ciliate, each subtending 1–2 flowers, the pedicels short to obsolete, to 0.5 mm long. *Flowers* (in bud) with the sepals 4. *Fruit* obovoid, subglobose or depressed globose (Stan-

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[4] Frutex arborve ad 5 m alta. Folia glabrata, subcoriacea, rigida. Inflorescentia dichasiorum florumque singularium in axillis glomeratorum, pusilla, bracteis apiceque pedunculorum minute puberulentis. Fructus haud suppetunt.

dley), 3–5 cm long, drying prominently longitudinally grooved; seeds numerous, tomentose-pilose with reddish brown hairs, ca. 10 mm long.

This species occurs in low elevation mountain forests of Panama and Costa Rica. The above description of fruit is taken from Costa Rican collections.

BOCAS DEL TORO: Buena Vista camp on Chiriquí Trail, 1250 ft, *Cooper 609* (F). PANAMÁ: Río Maje above first waterfall, 50 m, *Croat 34436* (MO, fruit only). Cerro Azul, *Dwyer 1358* (MO, SCZ).

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FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part VI

FAMILY 123. GUTTIFERAE

W. G. D'ARCY[2]

Trees or *shrubs*, sometimes epiphytic, rarely scandent, dioecious polygamous or with perfect flowers; sap often milky, white or yellow, often resinous; oil glands or passages always present, occurring in leaves and other parts. *Leaves* opposite, simple, entire, mostly evergreen, often coriaceous, the costa mostly conspicuous, the minor venation obscure in vivo, evident and offering many characters on drying; stipules mostly wanting, an axillary pit or other structure sometimes present. *Inflorescences* cymose, sometimes condensed and subumbellate or fasciculate, sometimes reduced to solitary flowers; leaves subtending the inflorescences often variously modified into bracts; scale-like, cucullate bracteoles usually present at the nodes of the inflorescence and sometimes subtending the pedicels of flowers where they may be difficult to distinguish from sepals; pedicels sometimes angled. *Flowers* mostly white, yellowish or pinkish, mostly regular, the perianth cyclical or spiral, often decussate; the axis convex or flat; sepals 2–14, imbricate, sometimes partly or wholly connate; petals 2–14, mostly free, imbricate, sometimes convolute; stamens mostly numerous, free or variously united, the outer ones often reduced, in pistillate flowers variously reduced in number, structure or obsolete; a disc sometimes present; ovary 1–10-locular, the carpels basally or entirely fused, indefinite or fixed in number, 1–10, the ovules 1 to many per locule, anatropous, the placentation various, the styles often free, sometimes wanting, the stigmas various but mostly flat. *Fruit* mostly capsular, sometimes baccate or drupaceous, often commestible and bird or mammal dispersed; seeds 1 to many, often enveloped by a colored aril which may be of differing histological origins; endosperm wanting.

The Guttiferae include about 40 genera with about 1,000 species, almost all tropical. Several genera are common to both New and Old Worlds, a distribution believed to reflect ancient land positions, and a few species are also common to more than one continent, perhaps also but less surely reflecting ancient land continuities. Species are best known from mature forests.

Plants of the Guttiferae can often be recognized by their coriaceous, pennineryed leaves and colored sap. Many species are epiphytic shrubs, and many

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[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator). The genera *Vismia* and *Hypericum* were published as the Hypericaceae in Ann. Missouri Bot. Gard. 65: 9–26. 1978. The Hypericaceae treatment was prepared by Norman K. Robson.

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have stilt roots. Axillary pits or other structures are frequently present on the petioles.

The Guttiferae provide many kinds of timber and many useful gums and resins. A number of trees are cultivated for ornament. Some species bear edible fruits.

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a. Inflorescences elongate, unbranched racemes; fruit linear with a narrow beak terminated by the globose stigma ..... 8. *Marila*

aa. Inflorescences cymose, if racemose then short; fruit ovoid to ellipsoid, if narrow then unbeaked and with 5 or more stigmas.

b. Leaves with many straight lateral veins and no minor venation.

c. Fruits indehiscent; leaves basally obtuse to rounded ..... 1. *Calophyllum*

cc. Fruits dehiscent; leaves basally narrowed and abruptly narrowed into the short petiole ..... 11. *Tovomita*

bb. Leaves with minor venation, the lateral veins often arcuate and forking.

d. Fruits indehiscent, styles mostly united or obsolete.

e. Epiphytic shrubs; fruit less than 8 mm long ..... 3. *Clusiella*

ee. Free standing trees; fruit more than 8 mm long.

f. Petiole without a margined pit adaxially at the base.

g. Flowers pink, globose; stamens 5, united into a column; sepals 5; leaves less than 3 cm wide ..... 10. *Symphonia*

gg. Flowers white, rotate; stamens numerous, free; sepals 2; leaves more than 5 cm wide ..... 7. *Mammea*

ff. Petiole with a margined pit adaxially at the base (Fig. 4, 8B–C).

h. Stamens free; native species ..... 9. *Rheedia*

hh. Stamens united into bundles; cultivated species ..... 5. *Garcinia*

dd. Fruits indehiscent, styles mostly divaricate or obsolete.

i. Ovules 2 to many per carpel; seeds numerous; plants often epiphytic.

j. Flowers 4-merous; stamens (staminodes) 4 in both staminate and pistillate flowers; fruit apically 4-lobed, 4-carpellate, the stigmas erect on the depressed apex ..... 6. *Havetiopsis*

jj. Flowers with 2–10 perianth parts; stamens mostly more than 4 or wanting; fruit more than 4-carpellate, the stigmas often stalked, not depressed ..... 2. *Clusia*

ii. Ovules 1–2 per carpel; seeds few; plants mostly free standing.

k. Outer perianth partly or completely fused in bud; petiole bases sometimes with conspicuous axillary structures.

l. Outer perianth completely fused in bud; petiole bases lacking axillary structures ..... 11. *Tovomita*

ll. Outer perianth only basally fused in bud; petioles with large basal axillary structures ..... 4. *Dystovomita*

kk. Perianth members all free, often imbricate; petiole bases lacking axillary structures ..... 12. *Tovomitopsis*

1. CALOPHYLLUM

Calophyllum L.,[3] Sp. Pl. 513. 1753; Gen. Pl. ed. 5. 229. 1754. TYPE: *C. calaba* L.

Trees, rarely shrubs, sometimes polygamous; latex yellow; twigs terete to compressed or angular, glabrescent; vegetative buds fine tomentose. *Leaves* opposite, the costa prominent, the lateral veins straight, parallel, numerous, alternating with resin ducts which may be sclerified and appear on the dried leaf surface as veins; petioles mostly short. *Inflorescences* mostly short axillary or terminal racemes, rarely forming reduced panicles; deciduous bracts sometimes present; pedicels usually slender. *Flowers* polygamous, sepals (2–)4, the inner pair often petaloid; petals 2–4 to many or wanting, opposite or imbricate; stamens mostly numerous, in staminate flowers congested in the middle, in pistillate flowers 2 to many seriate below the ovary, the filaments slender, sometimes basally connate; the anthers oblong or ovoid, basifixed, longitudinally dehiscent; ovary 1-locular, the style slender, inflexed in bud, the stigma peltate, the ovule 1, erect, anatropus. *Fruit* an indehiscent drupe, mostly subglobose, the endocarp hard or thin, the locule sometimes not filling the fruit; seed erect, ovoid or globose, the cotyledons 2, thick and fleshy.

Calophyllum includes over 100 species of both Old and New World tropics. Species are most abundant in the Old World. In Panama two species are native, and two other introduced species are sometimes cultivated as street trees. The fruit is not edible, but medicinal substances have been extracted from some species. The timber is valuable in some countries.

In a recent study of the genus in Panama, D'Arcy and Keating (1979) noted several collections which could not be assigned to species, and these specimens are still uncertain. In error, they cited *Dwyer 1670* and *Holdridge 6232* under *C. rekoi*, a species which is not known from Panama. These specimens are of *C. longifolium* Willd.

Literature:

D'Arcy, W. G. & R. C. Keating. 1979. Anatomical support for the taxonomy of *Calophyllum* (Guttiferae) in Panama. Ann. Missouri Bot. Gard. 66: 557–571.

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[3] Other synonyms have been used for this genus, but only this name has been used in relation to Panamanian plants.

Smith, A. C. & S. P. Darwin. 1974. Studies of Pacific Island plants XXVIII. The Guttiferae of the Fijian Region. J. Arnold Arbor. 55: 215–263.

Stevens, P. F. 1974. A review of *Calophyllum* L. (Guttiferae) in Papuasia. Austral. J. Bot. 22: 349–411.

———. 1976. The Old World species of *Calophyllum* (Guttiferae). 1. The Mascarene Islands. J. Arnold Arbor. 57: 167–184.

a. Leaf ribs (lateral veins plus ducts) fewer than 20 per cm; fruit with the locule filling less than half the interior, the remaining area filled with a corky material; cultivated tree ..... 1. *C. inophyllum*

aa. Leaf ribs more than 20 per cm; seed filling more than half the fruit interior, corky material thin, when present; cultivated and native trees.

b. Leaf ribs mostly 25–30 per cm, distinct; petals wanting; native tree .... 2. *C. longifolium*

bb. Leaf ribs mostly 30–40, on small leaves obscure and difficult to count; petals present or unknown; cultivated or native trees.

c. Leaves more than 6 cm long; cultivated species ..... 4. *C. soulattri*

cc. Leaves less than 6 cm long; native species, Cerro Jefe ..... 3. *C. nubicola*

1. **Calophyllum inophyllum** L.,[4] Sp. Pl. 513. 1753. TYPE: East Indies, Herb. Linn. (LINN 676.1, not seen; MO, microfiche).

Tree 4–10 m tall; trunk usually irregular; sap yellow. *Leaves* opposite, elliptical or obovate, 12–17 cm long, 6–9 cm wide, apically rounded or slightly retuse, basally rounded or obtuse, the costa prominent, stiff chartaceous, evanescent near the apex, subplane above, sharply elevated beneath, the lateral venation evident, ribs (veins and ducts) 18–20 per cm, the ducts not evident on the surface, the margins sometimes drying minutely revolute; petioles 1.5–2 cm long, drying dark brown, rounded concave above. *Inflorescences* axillary, racemes to ca. 13 cm long, flowers 1–4 at a node; the rachis minutely puberulent near the base; otherwise glabrous; pedicels 2–4 cm long, 1–4 at a node; bracts wanting; bracteoles minute. *Flowers* showy, white, ca. 2 cm across, fragrant, perfect; sepals ca. 4, the outer pair coriaceous, rotund, the interior pair petaloid; petals 3–6, obovate, stamens numerous (200–350), the filaments basally connate, the anthers oblong linear, 1–2 mm long; ovary glabrous, the style 6–8 mm long, much exceeding the ovary, the stigma peltate. *Fruit* subglobose, ca. 2.5 cm across, often apiculate, drying wrinkled and often glaucous brown, the locule occupying half the interior or less, the remainder packed with corky endocarp; seed ellipsoidal, ca. 2 cm long.

This species is native to the tropical area between Africa and Australia, where it occurs mainly along sea coasts. It is widely cultivated elsewhere as a street tree and lawn ornamental. In Panama it is called "Santa Maria."

CANAL ZONE: Near Gorgas Hospital, Ancon, *Blum 2209*; *Croat 4508* (both MO, SCZ). Ft. Clayton, *Loftin* 23 Nov. 1962 (SCZ). Ancón, *Maxon 6771* (US); *Mori 6899*; *Nee 11420* (both MO). Balboa, *Sharp* 4 Nov. 1962 (SCZ); *Standley 30868* (MO, US). Ancón, *Tyson & Blum 3455* (SCZ). Fort Sherman, *Tyson & Nee 7309* (MO). Ancón, *Zetek 11* (US). PANAMÁ: Universidad de Panamá, *Medina 45* (DUKE, MO). VERAGUAS: Divisa, *Carrasquilla 149* (DUKE, MO); *Lao 309* (both DUKE, MO).

[4] Synonyms are reported for this species by Stevens (1976); only this name has been used for Panamanian plants.

2. **Calophyllum longifolium** Willd., Ges. Naturf. Freund Berlin Mag. Neusten Entdeck. Gesammten Naturk. 5: 80. 1811. TYPE: America meridionalis, Herb. Willd. 10117 (B-Willd., not seen; MO, microfiche).

C. brasiliense subsp. *longifolium* (Willd.) Vesque in DC., Monogr. Phan. 8: 592. 1893.

Large polygamous *tree* to 35 m tall; trunk often buttressed; sap yellow, sticky. *Leaves* elliptical oblong or obovate, 11–20(–30) cm long, 5–9 cm wide, apically rounded, emarginate or retuse, basally obtuse or rounded, the costa prominent to the tip, minutely puberulent, slightly elevated above, conspicuously elevated beneath, the lateral veins evident, ribs (veins and ducts) (22–)25–30 per cm, the margins sometimes drying slightly revolute; petioles 2–4 cm long, drying sulcate. *Inflorescences* sometimes numerous, short racemes to 4 cm long, flowers 1–3 (–4) at a node, bracts wanting, bracteoles obsolete; pedicels to 5 cm long, the rachis minutely reddish puberulent. *Flowers* yellowish; sepals 4, rotund, 6–8 mm long, the outer pair wider; petals wanting; stamens 10–12, the filaments ca. 2 mm long, the anthers about as long; ovary ovoid, the style ca. 2 mm long, and shorter than the ovary, the stigma peltate. *Fruits* globose or ellipsoidal, ca. 3 cm across, often apically umbonate and sometimes apiculate; drying slightly rough, glaucous, the locule occupying more than half of the interior, the corky layer of endocarp thin; seed 1, ellipsoidal.

This species is native to Central America where it occurs in younger forests (Croat, 1978). It apparently ranges from Panama to Brazil and Peru, although the identity of these southern populations has not been verified. For a discussion of typification problems see D'Arcy and Keating (1979).

CANAL ZONE: Barro Colorado Island, *Croat 6451, 8532, 9564* (all MO, SCZ), *11948* (MO); *Foster 1341* (DUKE, MO), *1480* (DUKE, MO, SCZ); *Kenoyer 653* (US); *Shattuck 128* (A, MO), *435* (MO, SCZ, US); *Standley 31260* (A, US), *41011* (US); *Woodworth & Vestal 549* (A, MO). Headwaters of Río Arenal, *Johnston 1671* (A). Maru Towers, NW part of Canal Zone, *Johnston 1756a* (A). 10 mi NE of Gamboa Bridge on Pipeline Road, *Stern & Chambers 25* (A, MO, SCZ). COLÓN: Río Piedras along road to Portobelo, *Blum et al. 2524* (SCZ). Between Salud and Boca de Río Indio, *Howell 3, 44* (both MO). DARIÉN: Near Cerro Pirre base camp on Río Perrecénega, *Gentry 4774A* (MO—leaves only). La Palma, 0–50 m, *Pittier 6597* (US). HERRERA: El Montuoso-Las Minas, *Lao 571* (MO). PANAMÁ: Cerro Azul, *Folsom et al. 1950* (MO); *Gomez-Pompa et al. 3411* (MO); *Mowbray et al. 5132* (DUKE, GH, SCZ). Juan Díaz, *Standley 30609* (MO). VERAGUAS: Playa Rosario, Coiba Island, *Foster 1598* (DUKE, MO).

3. **Calophyllum nubicola** D'Arcy & Keating, Ann. Missouri Bot. Gard. 66: 566. 1979. TYPE: Panama, *Mori & Kallunki 7301* (MO).—FIG. 1.

Tree or *shrub* to 12 m tall, much branched, the twigs slender, stiff, ascending, drying yellowish or reddish brown but soon greyish, scruffy. *Leaves* elliptical, sometimes broadly so, small, to 6 cm long, 4.5 cm wide, stiffly coriaceous, plane but the margins minutely revolute, the costa conspicuous, subplane or elevated above, rounded to sharply raised beneath, evanescent distally, drying reddish brown, the lateral ribs somewhat obscure and appearing very numerous, actually 34–36 per cm, usually more distinct above, petiole 5–10 mm long, drying ca. 2 mm thick, with a narrow groove above. *Inflorescence* not seen. *Fruits* globose or slightly ellipsoidal, 20–25 mm long, conspicuously apiculate, the apicule 2–4 mm long, longer than broad, the basal stipe resembling the apicule, the surface

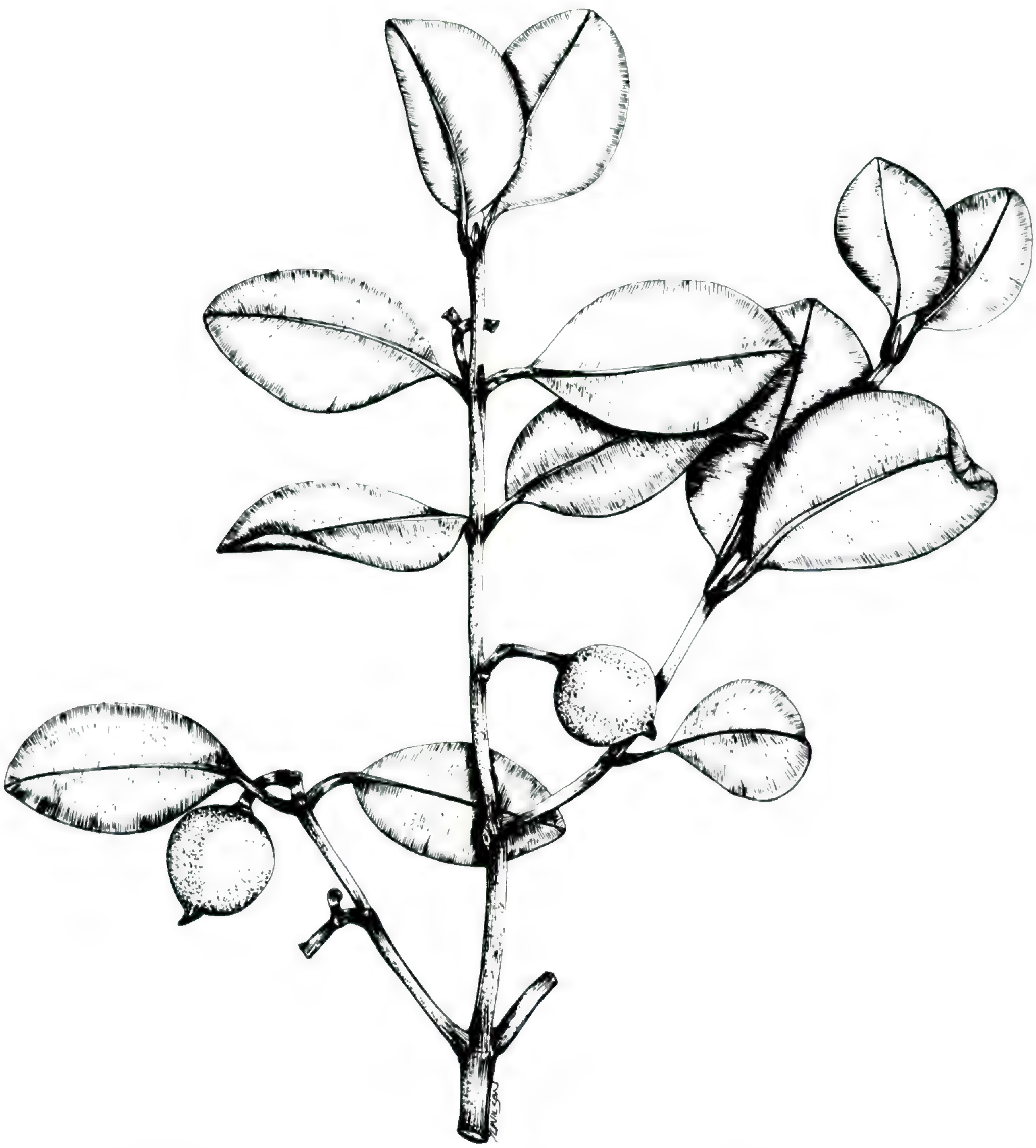

FIGURE 1. *Calophyllum nubicola* D'Arcy & Keating. Habit (×3/5). [After *Mori & Kallunki 6503* (MO).]

drying glaucous, reddish brown, wrinkled; fruiting pedicels 10–12 mm long, resembling the twigs; interior wall of the fruit papery, thin, dark brown, the endocarp stony; seeds globose, brown, occupying 4/5 of the locule.

This species is known only from Cerro Jefe, a lowland cloud forest reaching ca. 900 m elevation just northeast of Panama City. Woody plants in this habitat have notably coriaceous, small, entire leaves and much-branched twigs.

This species is distinctive in its small, flat leaves and in the much-branched appearance of the specimens. The lateral venation is obscure, and the ribs are difficult to count. The seed is loose and rattles inside the fruit, but it fills over 4/5 of the locule. There is no spongy tissue in the unfilled portion of the locule.

PANAMÁ: Cerro Jefe, *Dwyer et al. 7301*; *Mori & Kallunki 6503, 7301*; *Mori 7128* (all MO).

4. **Calophyllum soulattri** Burm. f., Fl. Indica 2: 121. 1768. TYPE: Java, not seen.

Tree; twigs fine tomentulose. *Leaves* oblong or narrowly ovate, 10–20 cm long, 3–7 cm wide, apically short acuminate into a drip tip, basally obtuse, the costa elevated or plane above, elevated beneath to the tip, sparingly puberulent, lateral veins evident, ribs (veins plus ducts) 39–40 per cm, the margins mostly not drying revolute, petioles 1–1.5 cm long, drying dark, minutely tomentose, grooved above. *Inflorescences* short cymes fasciculate in the leaf axils, crowded, the peduncle basally pubescent, bracts wanting, bracteoles obsolete; pedicels ca. 1.5 cm long, glabrous, slender. *Flowers* perfect, sepals 2; petals 2(–3), ca. 8 mm long, rotund, apically ciliolate; stamens 60–100 (Stevens, 1976), the filaments ca. 3 mm long, basally connate, the anthers oblong, ca. 2 mm long; ovary glabrous, the style ca. 3 mm long, the stigma peltate. *Fruit* ovoid to globose, ca. 10 mm across, sometimes apiculate, drying brown, often glaucous, more or less smooth.

This species is recognizable by the very numerous ribs of the leaves and by the small fruit.

Calophyllum soulattri is native to Papuasia, and it occurs naturally from India to Australia. Elsewhere in the tropics it is occasionally grown as an ornamental tree. The few collections from Panama are from cultivated trees.

CANAL ZONE: Without other locality [?Summit Garden], *Johansen 77* (MO). Ancón, *Paul 348*; *Pittier 6646, 6678* (all US).

2. CLUSIA

Clusia L.,[5] Sp. Pl. 509. 1753; Gen. Pl. ed. 5. 226. 1754. TYPE: *C. major* L.

Triplandron Benth., Bot. Voy. Sulphur 73, *t. 38*. 1844. TYPE: *T. lineatum* Benth. ≡ *Clusia lineata* (Benth.) Pl. & Tr.

Trees or *shrubs*, mostly dioecious, often epiphytic, sometimes scrambling; sap often milky, white or yellowish. *Leaves* opposite, simple, entire, the margins often drying revolute, the costa usually evident, the lateral and minor venation mostly not apparent, on drying the lateral venation usually manifest, often anastomosing at the margins to form submarginal or marginal veins, the leaves sometimes lineolate; petioles present and distinct or indistinct or wanting. *Inflorescences* cymose, forming panicles or rarely reduced to solitary flowers; bracts sometimes present; scale-like bracteoles usually present at each articulation, sometimes subtending the calyx. *Flowers* in bud mostly globose; sepals 4–5, decussate or imbricate, rotund; petals 4–9, ovate or decussate, rotund; androecium in staminate flowers mostly numerous, indefinite, free, basally connate, sometimes part or all concreted into a massive "receptacle"; in pistillate flowers the staminodes often obsolete, sometimes reduced to an annulus, sometimes free; in staminate flowers the gynoecium mostly rudimentary or obsolete, in pistillate

[5] A number of other synonyms have been used for this genus. Only these names have been used in relation to Panamanian plants.

flowers the gynoecium consisting of 4–10 basally or entirely connate carpels, the ovules mostly numerous, anatropous, subhorizontal, ascending or pendulous, the styles connate or not, sometimes obsolete, often spreading, the stigmas sessile, usually black, linear, circular or triangular. *Fruit* a fleshy or leathery tardily dehiscent capsule, the seeds large or small, enveloped in an often colored aril, the arils sometimes enveloping more than 1 seed.

Clusia is distinguished by its many seeded leathery or fleshy fruits. Many species have stiffly coriaceous leaves, and many have leaves with strongly ascending venation. The genus is confined to the New World tropics where several hundred species have been recognized.

Taxonomically *Clusia* is an extremely difficult genus to study. Flowers are present on plants for only short periods, and they do not persist well on herbarium collections. Therefore, although flowers appear to provide a number of distinguishing characters, most analyses must be made on the basis of fruits and vegetative materials which present uncertain characteristics. Many species have been described from South America, but little type material was borrowed for this study. Apomicty has been suggested in more than one line (Maguire, 1978). A further complicating factor was that much material, Panamanian and other, at New York Botanical Garden and a number of type collections, out on loan from the Field Museum of Natural History since 1952 were not available for this study. In particular the types of *Clusia cooperi* Standley (Field Mus. Nat. Hist. Bot. Ser. 4: 234. 1929) and *C. stenophylla* Standley were not available. In the case of *C. cooperi*, based on the description alone, it was not possible to identify this taxon among currently available collections so it has been omitted entirely. In the case of *C. stenophylla*, the name is used for a taxon of which one collection was annotated by Maguire. The analysis provided here is highly tentative, and not all the entities recognized and names used can be considered reliable.

Clusia is of minor importance to man. Some species have provided gums for caulking and materials for writing, but woods are generally not of merchantable size.

Literature:

Britton, N. L. & C. F. Millspaugh. 1920. The Bahama Flora. New York.

Maguire, B. 1978. Apomixis in the genus *Clusia* (Clusiaceae). Taxon 25: 241–244.

Nowicke, J. W. 1970. Photographs of the Panamanian collections of B. D. Seemann. Ann. Missouri Bot. Gard. 57: 352–358.

a. Leaves petiolate (either with a distinct petiole or petiolar area).
  b. Leaves as wide as long or nearly so, apically rounded to emarginate, coriaceous.
    c. Fruits more than 2 cm across; leaves with the submarginal vein obscure ..... 11. *C. major*
    cc. Fruits less than 2 cm across; leaves with submarginal vein usually conspicuous above 1 mm from the margin ..... 14. *C. osseocarpa*
  bb. Leaves longer than wide, apically obtuse or acute, coriaceous or not.
    d. Leaves blunt or rounded apically.
      e. Petioles more than 1.5 cm long; leaves often more than 8 cm wide ..... 10. *C. longipetiolata*
      ee. Petioles less than 1.5 cm long; leaves mostly less than 8 cm wide.

f. Peduncles stout, more than 2 cm long ..... 17. *C. stenophylla*
ff. Peduncles mostly slender, less than 2.5 cm long.
g. Lateral veins appearing so numerous as to be indistinct; bark of ultimate twigs mostly exfoliating curly yellowish .... 12. *C. minor*
gg. Lateral veins numerous but main veins distinct at least from above; bark of twigs not exfoliating ..... 8. *C. liesneri*
dd. Leaves sharp pointed.
h. Leaves large, more than 6 cm wide with a sharp drip tip, the lateral veins nearly at right angles to the costa and with copious close minor veins running perpendicular between them ..... 5. *C. divaricata*
hh. Leaves smaller, less than 6 cm wide, mostly lacking a sharp drip tip, the lateral nerves ascending, lacking numerous minor cross veins.
i. Flower buds with perfect prefloration (outer perianth fused and tearing to permit floral egress) ..... 3. *C. croatii*
ii. Flower buds with valvate or imbricate prefloration.
j. Leaves small, mostly less than 4.5 cm wide.
k. Fruits elongate ..... 6. *C. dukei*
kk. Fruits rotund.
jj. Leaves larger, mostly more than 4.5 cm wide.
l. Lateral veins distant, mostly more than 5 mm apart, arcuate, the upper side of the leaf strongly-ascending lineolate ..... 13. *C. oedematopoidea*
ll. Lateral veins closer, mostly straight, leaf upper sides not lineolate.
m. Lateral veins appearing so numerous as to be indistinct; bark of ultimate twigs mostly exfoliating curly yellowish ..... 12. *C. minor*
mm. Lateral veins numerous but distinct, mostly 2–3 mm apart, bark not exfoliating on twigs ..... 9. *C. lineata*
aa. Leaves sessile (petioles less than 5 mm long), lacking a petiolar area.
n. Leaves small, less than 5 cm wide, often drying pinkish.
o. Venation obscure, especially above; fruits less than 1 cm across .... 1. *C. coclensis*
oo. Venation evident, especially above; fruits more than 1 cm across .. 15. *C. rotundata*
nn. Leaves larger, more than 5 cm wide, seldom drying pinkish.
p. Fruit narrow, elongate; basal sides of leaf nearly straight ..... 7. *C. fructiangusta*
pp. Fruit rotund; all sides of leaf curved.
q. Fruiting styles slender, connivent, forming an anemone-like structure, the stigmas 2 mm long; bark of twigs sometimes exfoliating .... 15. *C. rotundata*
qq. Fruiting styles stout or obsolete, divaricate, often recurving, stigmas mostly more than 3 mm long; bark not exfoliating.
r. Fruiting stigmas sessile, ca. 7 mm long, forming a ring (adaxial or apical area) 1 cm across ..... 2. *C. congestiflora*
rr. Fruiting stigmas, shorter, on styles or not, an apical area or ring adaxial to the stigmas wanting.
s. Corollas erose margined; pistillate androecium a cone-like annulus (Fig. 2E); fruit red or pink; bracts wanting or not defined; stigmas triangular ..... 4. *C. cupulata*
ss. Corollas entire; pistillate androecium reduced to 5 low teeth; fruit yellow or green, sometimes suffused with russet; inflorescence subtended by bracts; stigmas linear ..... 16. *C. salvinii*

1. **Clusia coclensis** Standley, Ann. Missouri Bot. Gard. 27: 321. 1940. TYPE: Panama, *Allen 771* (F, holotype, not seen; MO, isotype).

Shrub or *tree* to 8 m or more tall, sometimes epiphytic; sap white; twigs stout or slender, sometimes drying dark. *Leaves* small, 4–6(–10) cm long, 2–3(–6) cm wide, obovate or elliptical, the venation mostly obscure, slightly ascending, sometimes with numerous fine, strongly ascending lineolate markings, in many specimens only the terminal 1–2 pairs of leaves persisting, discolorous, the margins slightly revolute, stiffly coriaceous, apically rounded, basally cuneate, sessile or

the petiole only 2–5 mm long. *Inflorescence* a short, congested terminal cymose panicle, bracts foliaceous, about half as long as the leaves, bracteoles scale-like, 2–10 mm long. *Flowers* (fide Standley) white, sepals rotund with broad membranaceous margins, 9 mm long, petals ca. 6, to 1.5 cm long, rotund, the margins minutely serrate, pale on drying; stamens numerous, strongly unequal, the anthers linear, 3 mm long. *Fruits* turbinoid, ca. 1 cm long, the styles basally connivent then divergent, ca. 3 mm high, stigmas minute, ca. 1 mm long.

This species is distinct in its small, uniform textured rotund leaves which often dry pinkish and in its small fruits. Otherwise it is similar to *C. rotundata* with which it may be conspecific. The fruits of *C. polyantha* Cuatr. of Colombia are quite similar, but the leaves of that species are much larger. A photo of the type (Peru, *Pavon,* G-Delessert) of *Clusia pseudohavetia* Pl. & Tr. displays fruits of similar size and shape, but the leaves are much larger and the styles and stigmas appear to be different.

Clusia coclensis is known only from low and middle elevation cloud forests in Panama and Costa Rica.

CHIRIQUÍ: N of San Félix on Cerro Colorado copper mine road along continental divide, 5000–5500 ft, *Mori & Kallunki 5944*; *Mori & Dressler 7896* (both MO). COCLÉ: El Valle 800–1000 m, *Allen 771* (MO). Cloud forest, slopes of Cerro Pilón, 700–900 m, *Duke 12114* (DUKE, MO). Elfin forest, Cerro Caracoral, 1000 m, *Duke & Dwyer 15073* (MO). Alto Calvario [N of El Copé], 600–800 m, *Folsom 3173* (MO); *Folsom & Collins 6471* (MO). COLÓN: Santa Rita Ridge road 4 mi from Transisthmian Highway, 500 m, *Gentry et al. 8863* (MO). PANAMÁ: Cerro Jefe, *Folsom et al. 2511* (MO). VERAGUAS: La Yeguada, *Luna 12* (MO).

2. **Clusia congestiflora** Cuatr., Rev. Acad. Colomb. Ci. Exact. 8: 52. 1950. TYPE: Colombia, *Garcia-Barriga 13177* (US).

C. perscariosa Maguire, Phytologia 38: 210. 1978. TYPE: Panama, *Mori & Kallunki 5108* (MO, holotype; NY, isotype).

Shrub or *tree* to 7 m tall, often epiphytic, twigs quadrangular, mostly drying terete and sulcate. *Leaves* broadly obovate, apically rounded, basally cuneate, mostly 15–30 cm long, 9–15 cm wide, thick, rigidly coriaceous, the costa prominent to near the tip, flanked basally by two parallel indistinct lines; lateral nerves numerous, straight, ascending, terminating abruptly in a submarginal vein to 2 mm from the margin, drying slightly elevated on both sides; petiole not defined, 2–5 cm long, conspicuously winged by the leaf base, somewhat clasping the stem. *Inflorescence* terminal, many-flowered, congested, rounded; peduncle short and stout, ca. 2 cm long, 6–10 mm thick often curved; pedicels 3–4 mm long, thick, obscured; bracts 2, rotund, subfoliaceous, 2–4 cm long. *Flowers* with sepals 3–4, imbricate, the outer pair thicker, larger, rotund, keeled, 6–12 mm long; petals white or pink, sometimes greenish, 6, oblanceolate or broadly elliptic, in staminate flowers the stamens numerous, congested, the filaments ca. 1 mm long, the anthers linear, ca. 4 mm long, laterally dehiscent, the connective produced into a minute apiculum; pistillate flowers with 8 staminodes basally connate into an annulus, the ovary crowned with 6–7 thick subsessile stigmas, the locules many-ovulate. *Fruit* globose or subcylindrical, 3–4 cm long, ca. 2.5 cm wide, the stigmas sessile, ca. 1 mm long forming streaks down the distal end of the capsule.

This species may be recognized by its large, rotund coriaceous leaves with secondary venation terminating abruptly at the submarginal vein as in *C. rotundata* and *C. osseocarpa,* but in those species the petiole is slender and distinct, while in *C. congestiflora* it is broadly winged by the leaf base. It is also distinct in its globose, ribbed fruit which is fringed at the apex by a circle, 1 cm in diameter, of elongate (8 mm long), sessile stigmas.

Clusia congestiflora occurs in Panama and western Colombia in wet lowland forests.

DARIÉN: Cerro Pirre, 600–1400 m, *Duke 5317* (MO, US); *Gentry et al. 7032* (MO). PANAMÁ: Cerro Azul, *Blum et al. 1797* (MO). Camino de Llano a Cartí, *Correa et al. 1850* (DUKE, MO). Cerro Jefe, *Gomez-Pompa 3054* (MO). El Llano Cartí road, *Kennedy 2712, 2526* (both MO); *Liesner 687* (MO, US); *Mori et al. 4704* (MO).

3. **Clusia croatii** D'Arcy.[6] TYPE: Panama, *Croat 37197* (MO).

Tree or *shrub* to 5 m tall, sometimes epiphytic and strangling; sap white; twigs indistinctly angled. *Leaves* obovate or elliptical, mostly 7–11 cm long, 3–6 cm wide, apically acuminate, sometimes with a drip tip, basally obtuse, the costa drying plane above, elevated beneath in the proximal half, lateral veins slightly arcuate, 3–4 mm apart, but sometimes biseriate and 2–3 mm apart, the submarginal vein 0.5–1.0 mm from the margin, a minute marginal vein sometimes partly present, drying slatey green above, yellowish or brownish green beneath; petioles distinct, ca. 1 cm long, angled. *Inflorescences* short, 3–4 cm long, cymose, peduncle slender but stiff, angled, 7–10 mm long; bracts not differentiated, bracteoles conspicuous, ca. 3 mm long, acute, cucullate with a sharp keel; pedicels to 4 mm long, sometimes obsolete. *Flowers* with the buds turbinoid, 5 mm long, 6 mm wide, stramineous and evenly ribbed, prefloration complete, sepals 4, decussate, stramineous, ribbed, the outer pair fused in bud except sometimes minutely free at the beak, upon splitting ovate, acute, 6 mm long, the inner sepals somewhat larger, rounded; petals 7, imbricate(?) or quincuncial, rotund, slightly erose margined, ca. 10 mm long; staminate androecium consisting of a peltate hemispherical mass with numerous elliptical stamens immersed around the periphery and numerous staminodes immersed around the periphery of the somewhat flattened apex, gynoecium not evident. *Fruit* (immature) elongate, the stigmas ca. 8, sessile forming a flat cap at the apex.

Clusia croatii may be recognized by its completely fused outer sepals which must split lengthwise to permit egress of the inner floral parts. These flower buds are turnip shaped with a minute beak and dry a straw color with faint lines. The small ovate or elliptical leaves are also distinctive.

To judge from the staminate androecium, this species is closely related to *Clusia liesneri* which also has the filaments or connectives united into a hemispherical mass with the stamens and staminodes immersed and appearing as

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[6] *Clusia croatii* D'Arcy, spec. nov. Arbor vel frutex, nonnumquam epiphyticus, foliis parvis, ellipticis v. obovatis; sepalis extimis in alabastro connatis; staminibus floris masculini receptaculo staminali solido insertis, staminodiis etiam insertis.

circles or ellipses. In *C. liesneri,* however, the filaments are not completely fused at the center, the stamens and staminodes are circular rather than ellipses, and there is much greater distance between the rings of stamens and staminodes. The leaves of the two species are quite different.

This species has been collected from low and middle elevations in widely scattered parts of Panama.

BOCAS DEL TORO: Valley of Biarra River, Chiriqui Lagoon, *Seibert 1539* (MO). CANAL ZONE: Madden Dam area, Boy Scout road, *Dwyer 8825, 8825A* (both MO). CHIRIQUÍ: Cerro Colorado 33.1 km beyond bridge over Río San Félix, 1400 m, *Croat 37197* (MO). COCLÉ: Cerro Pilón 5 km NE of El Valle, 800–1045 m, *Mori et al. 6619* (MO). PANAMÁ: Cerro Campana 2000 m, *Weaver & Foster 1675* (DUKE).

4. **Clusia cupulata** (Maguire) Maguire, Phytologia 39: 70. 1978.—FIG. 2E.

C. salvinii var. *cupulata* Maguire, Phytologia 38: 212. 1978. TYPE: Panama, *Gentry & Mori 13407* (MO, holotype; NY, PMA, isotypes).

Epiphytic *shrub* or *tree* to 8 m tall; twigs relatively slender, drying dark gray or slightly reddish, the internodes mostly short, sap milky. *Leaves* obovate, apically rounded, basally cuneate, the midrib prominent in the proximal half, the lateral veins strongly ascending, distinct, sometimes appearing in two series, forming an even submarginal vein ca. 2 mm from the margin, stiffly coriaceous, on drying the margins mostly not revolute, becoming thin and somewhat discolorous, drying smooth, often with a pinkish cast; petioles ca. 5 mm long, broad but not conspicuously clasping the stems, not drying dark. *Inflorescence* terminal, the uppermost pair of leaves sometimes reduced and bracteate, few-flowered; peduncle mostly less than 2 cm long, sometimes sparingly branched, sharply angled, each node with a pair of sturdy, scale-like bracts 2–3 mm long. *Flowers* with the sepals ca. 7 in 2 series, the outer pair opposite, bract like, obtuse, 4 mm long, the inner series rotund, 1–1.5 cm across; petals white ca. 7 spathulate, erose, 2.3 cm long, ca. 2 cm wide apically; androecium of pistillate flower a caducous ring or frustum ca. 6 mm tall; ovary turbinoid, the stigmas 6–8, drying black, forming a hemispherical cushion on top of the ovary. *Fruit* red or pink, turbinoid to globose, 3 cm across, the styles triangular, sessile, connivent up to the very top of the fruit.

Herbarium sheets of this species resemble several other Panamanian species and separation cannot always be made with confidence. *Clusia cupulata* differs markedly, however, in the pistillate flowers, which have large, erose margined petals and a cone-like androecial annulus not present in other species. The red or pink fruit is also noteworthy. Leaves of some collections tend to resemble such species as *C. congestiflora,* but they are larger and slightly less stiff. From *C. salvinii* separation is often nearly impossible without flowers, but the leaves tend to dry smoother, and there is no evidence of well-formed bracts subtending the inflorescence branches. The stigmas of this species are somewhat different from the other species noted in forming a relatively broad, flat cushion on the ovary which is not elevated with maturity. It is likely that some collections of this species have been cited in the treatment under other species.

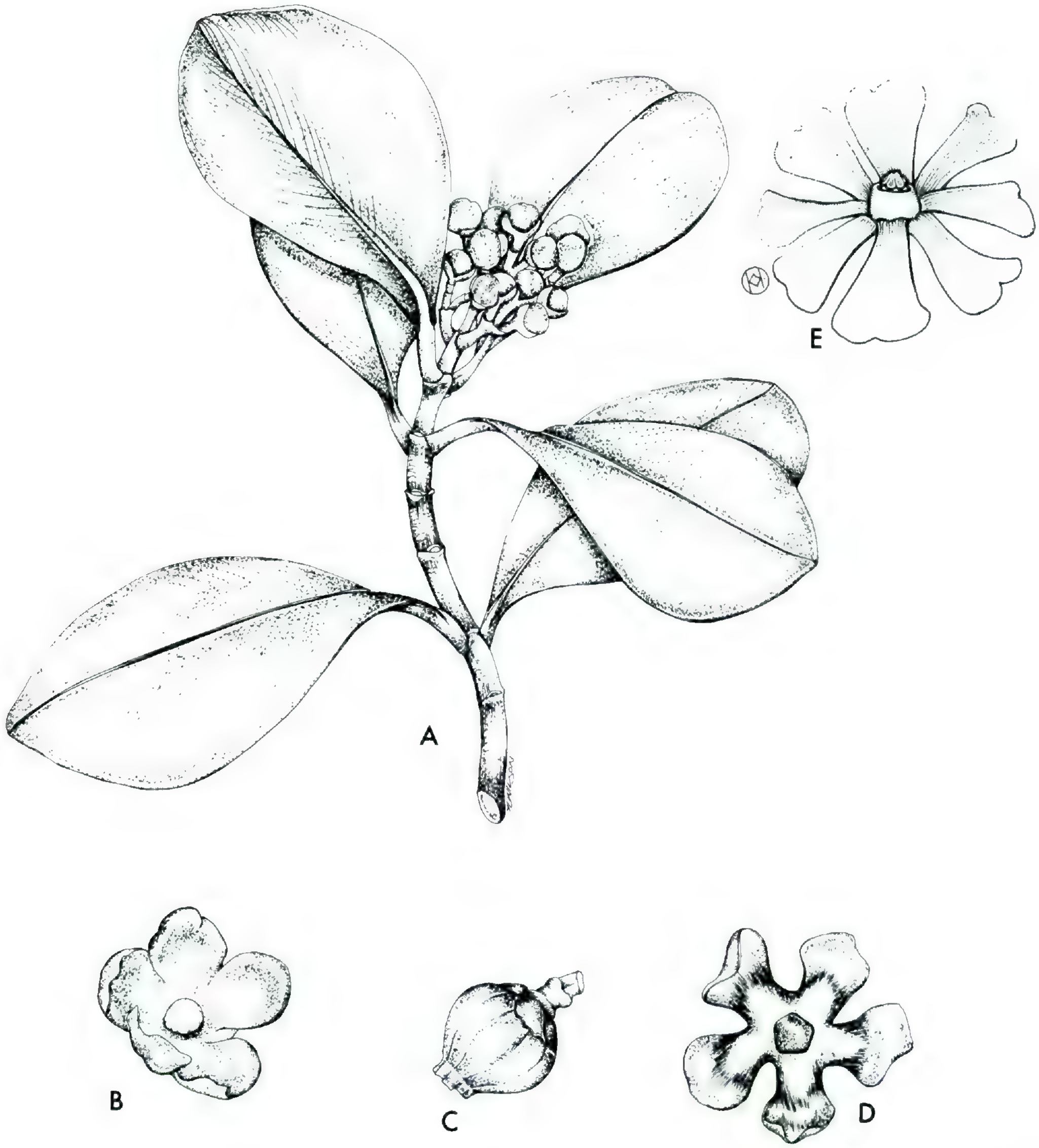

FIGURE 2. *Clusia*. A.–D. *C. minor* L.—A. Habit (×½). [After *Croat 5434* (SCZ).]—B. Female flower (×⅝).—C. Fruit (×⅝). [After *Croat 5058* (SCZ).]—D. Male flower (×⅝). [After *Croat 13478* (MO).]—E. *C. cupulata* (Maguire) Maguire—Flower (×⅝). Note annular, sleeve-like androecium [After *Gentry & Mori 13407* (MO).]

CHIRIQUÍ: 3 km NE of El Hato del Volcán, 1500–1800 m, *Davidse & D'Arcy 10350* (MO). COLÓN: Santa Rita lumber road 8.7 km E of Transisthmian Highway, *Folsom 3695* (MO). PANAMÁ: Road to Cartí 15.5 km N of El Llano, *Busey 367* (MO). Cerro Jefe, *Gentry & Mori 13407* (MO, NY, PMA). El Llano-Cartí Road 8–12 km N of El Llano, 400–450 m, *Mori et al. 4545*; *Nee et al. 8782* (both MO). 18.9 km N of Cerro Azul, *Mori & Kallunki 4999* (MO).

5. **Clusia divaricata** Maguire, Phytologia 38: 65. 1978. TYPE: Panama, La Mesa 6 km above El Valle, 600 m, Coclé Prov., *Maguire & Huang 65521* (NY, not seen).

Shrub or *tree* to 10–15 m tall, sometimes epiphytic or scandent, with a low and rounded crown (*Duke & Dwyer 13941*); branches terete, divaricate, sap yellow or white turning orange. *Leaves* elliptical, mostly 13–23 cm long, 8–10 cm wide, apically with a short acuminate drip tip, basally obtuse, chartaceous, the costa sharp beneath and in the proximal half above, lateral veins numerous, mostly 3–4 mm apart, parallel, slightly and evenly arcuate, with a minute (visible above with the naked eye), somewhat irregular vein-like tracery between the lateral veins; petiole slender, 2.5–6 cm long, plane or slightly channelled above, basally winged and cucullate, slightly clasping the stem. *Inflorescences* sexually dimorphic, the male inflorescence an elongate raceme or thyrsoid panicle to 30 cm long, the axis stiff, straight, drying 5–8 mm across near the base, ca. 3 mm thick apically, the distal leaves somewhat reduced, each branching with 2 cucullate thick, ovate, bracts to 10 mm long, the bracts reduced upwards in the inflorescence; the branches spreading; female inflorescence a short, bulky raceme to 10 cm long bearing a pair of much reduced leaves just above the base, the basal segments drying angled or squarish, peduncles ca. 10 mm long, somewhat longer in fruit, with a pair of cucullate bracts ca. 5 mm long at about the middle and a solitary bract at the base; flower buds globose, 10–15 mm across, often nodding. Male *flowers* with 4 decussate broadly rotund sepals, petals spathulate, the claw broadly rotund, sometimes slightly emarginate, white or pinkish white, ca. 25 mm long, appearing crenulate on drying; stamens very numerous, free, the anthers with the 2 pairs of thecae ca. 2 mm long, linear, lateral but more or less ventral along the connective, those of the outer stamens reaching or exceeding the apex of the connective, inwards gradually lower on the connective until in the center of the flower they are rudimentary or absent and the connectives, each terminated in a small knob, are coalesced into a hard, convex or conical mass, the anthers contrasting in color; receptacle flat; female flowers with the stamens rudimentary in basally united clusters inserted below a minute disc. *Fruit* obovoid, 30–38 mm long, 25–30 mm across, remaining green or becoming pink (*Luteyn 1632*); stigmas sessile, 8–10 dehiscing longitudinally into narrow valves; seeds orange (?or covered with an orange aril).

This species occurs in wet forests on low elevation mountains in Panama.

COCLÉ: El Valle de Antón, *Croat 37401* (MO). Top of El Petroso N of El Copé, *D'Arcy 11363* (MO). El Valle, *D'Arcy & Hammel 13315, 13332* (both MO). Between Cerro Pilón and El Valle, *Duke & Dwyer 13941* (SCZ). Cerro Pilón, *Duke & Lallathin 15024* (MO). La Mesa, *Dwyer & Nee 11945*; *Folsom 1353* (both MO). Cerro Pilón, *Gentry & Dwyer 3626* (MO). Hills above El Valle, *Gentry 6905*; *Kirkbride 1059* (both MO). Cerro Pilón, *Lallathin 36-3* (MO). N of El Valle de Antón, *Luteyn & Kennedy 1632* (DUKE); *Mori & Kallunki 2971* (MO). PANAMÁ: Cerro Campana, 800 m, *Allen 3960* (MO). El Llano to Cartí Road, *Folsom et al. 1912* (MO). Cerro Campana, 800–1000 m, *Gentry 4912*; *Mori & Kallunki 2470* (both MO). SAN BLAS: El Llano to Cartí Road, *Folsom 2618* (MO). VERAGUAS: 3.5–4.5 mi above Santa Fé, *Gentry 3072* (MO). Alto Piedra, Santa Fé, 1200 m, *Lao & Maasola 481* (MO, PMA). Cerro Tute, *Mori 6246* (MO).

6. **Clusia dukei** Maguire, Phytologia 39: 67. 1978. TYPE: Panama, *Kirkbride & Duke 958* (MO, holotype).

Tree to 6 m tall, mostly epiphytic, twigs mostly drying blackish, sometimes grayish in maturity; sap sparse, sticky, clear, except in the fruit. *Leaves* narrowly elliptical or obovate, pointed at each end, blunter apically, the costa evanescent

distally above, lateral veins strongly ascending, distinct and evident or not, mostly not drying revolute, often drying pinkish; petioles short, to ca. 1.5 cm. *Inflorescences* cymose, mostly reduced to 1–2 flowers, the peduncles and pedicels short, bracts wanting, bracteoles scale-like. *Flowers* (Maguire) with the buds 5–6 mm across; sepals perhaps 4, decussate; stamens numerous, free, the filaments thick, ca. 1 mm long, the connective thick, the anthers laterally dehiscent, ca. 2 mm long. *Fruit* elongate, oblong or ellipsoidal, 4–5 cm long, the 8 styles sometimes gradually forming a beak, or the stigmas nearly sessile, 1–2 mm long, forming a cushion ca. 5 mm across; seeds (Maguire) many, ca. 4 mm long.

This species is identified by its elongate fruit. However, differences in shape of the fruit and leaves and in details of the fruiting stigmas between the collections cited suggest that more than one species is present. All collections seen are from low or middle elevations in central and western Panama.

CHIRIQUÍ: Llano del Volcán, 1500 m, *Allen 3503* (MO). Llanos Francia, 4000 ft, *Dwyer & Lallathin 8720* (SCZ). Volcán Llanos between Volcán and Bambito, 1400 m, *Folsom 4088* (MO). Cerro Colorado, road to Bocas del Toro just above face of mine, 1600–1700 m, *Folsom et al. 4754* (MO). Between Pinola and Quebrada Hondo toward summit on Chiriqui Trail, *Kirkbride & Duke 893, 931, 958* (all MO). PANAMÁ: El Llano Cartí road, 16–18 km N of Panamerican Highway, 400–450 m, *Nee & Tyson 10960* (MO); *Tyson & Nee 7320* (MO). VERAGUAS: Valley of Río Dos Bocas between Alto Piedra and Calovébora, 350–400 m, *Croat 27396* (MO).

7. **Clusia fructiangusta** Cuatr., Rev. Acad. Colomb. Ci. Exact. 8: 33. 1950. TYPE: Colombia, *Cuatrecasas 16206* (F, holotype, not seen; US, isotype).

Shrub or small *tree* to 15 m, usually epiphytic; latex white; stems drying sharply angled. *Leaves* obovate or obcuneate, apically rounded, basally cuneate, mostly 8–12 cm long, 6–7 cm wide, the costa elevated beneath almost to the apex, the lateral nerves ascending, straight, parallel, distinct beneath, ill defined above, drying discolorous, above slightly shiny, beneath dull and somewhat yellowish; petiole wanting, the leaf base slightly clasping the stem. *Inflorescence* a terminal panicle often exceeding the leaves; peduncle and branches angled, the peduncle naked for 5–8 cm; bracts cucullate, ca. 5 mm long, conspicuous; pedicels strongly angled, 2–6 mm long but appearing obsolete; sepals 6, decussate, broad, 4–6 mm long, rotund; petals 4, decussate, broadly ovate, white or bluish, often purplish at the base or maculate above; in pistillate flowers the staminodes concrescent into a thick cylindrical ring; ovary cylindrical, stigmas 7–8. *Fruit* (Cuatrecasas) narrowly cylindrical or ellipsoidal, 3–3.5 cm long, longitudinally grooved, the stigmas subsessile; seeds very numerous, linear elliptical, the raphe linear, the membranous laciniate aril 3–3.2 mm long, ca. 1 mm wide, red.

This species is known from the Pacific slope of Colombia, from Ecuador, and from wet forests in Panama.

COCLÉ: Road from La Pindeda to El Copé by way of Piedras Gordas, *Hammel 2575* (MO). PANAMÁ: Road to Cartí 19 km N of El Llano, *Busey 903* (MO); *Correa et al. 1871* (DUKE, MO, PMA); *Kennedy et al. 2430* (MO); *Mori et al. 4700* (MO).

8. **Clusia liesneri** Maguire, Phytologia 39: 70. 1978. TYPE: Panama, *Liesner 1273* (MO, holotype).

Shrub or *tree* to 15 m tall, often epiphytic; twigs often angled. *Leaves* obovate, 7–12 cm long, 4–5 cm wide, apically blunt, rounded or obtuse, basally narrowed into the short petiole, the lateral veins strongly ascending, prominent and distinct above, prominent but sometimes indistinct beneath, often drying discolorous, slatey above, green or lighter beneath, subcoriaceous; petioles distinct but short, ca. 5 mm long. *Inflorescences* cymose paniculate, short; peduncles 1–2 cm long, angled, bracts wanting, bracteoles conspicuous, cucullate, 2–3 mm long, the margins thinned and sometimes drying discolorous; pedicels stout, 1–3 mm long, obscured by bracteoles. *Flowers* with the buds pinkish, sepals (Maguire) 6, decussate, concave orbicular; petals 5–6-ribbed; androecium consisting of a dark hemispherical mass of 5–6 filaments, the stamens circular 1–2-seriate, immersed basally and abaxial to this with 6–10 circular reduced anthers immersed in the apex of the androecial mass. *Fruit* obovoid, apically flat, the stigmas sessile, connivent, partially enveloped by the persistent sepals.

This species is distinct in its staminate androecium which appears as a solid, hemispherical mass with a ring of circles at the apex and another ring at the base. These circles are anthers and staminodes, immersed in the filamentary or connective tissue. The connectives are connivent and partly or entirely connate. Maguire implied that the anthers surrounding the base are fertile ones and that the apical ring is made up of staminodes.

Vegetatively, the leaves of this species closely resemble those of *C. rotundata*, but there is a definite petiole below the narrowed leaf base whereas those in *C. rotundata* are essentially sessile, the leaf base not appearing petiolate.

Clusia liesneri is known from low elevation wet and moist forests in Panama and Costa Rica. (Alajuela, 7.7 km N of San Ramón on road to Balsoa, *Wilbur 20215* (DUKE)).

COLÓN: Río Guanche ca. 2.5 km upriver from ridge on road to Portobelo, *Mori et al. 6472*; *Mori & Witherspoon 7970* (both MO). PANAMÁ: Road to Cartí, N of El Llano, *Busey 904* (MO). Cerro Jefe, 700 m, *Correa & Dressler 968*; *Croat 17347* (both MO). 9.4 km N of Goofy Lake, *Folsom et al. 1960* (MO). El Llano-Cartí road, 300–500 m, *Liesner 1273*; *Mori & Kallunki 5575*; *Nee & Tyson 10972* (all MO). VERAGUAS: NW of Santa Fé 4.2 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 4823*; *Nee 11293* (both MO).

9. **Clusia lineata** (Benth.) Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 13: 345. 1860.

Triplandron lineatum Benth., Bot. Voy. Sulphur 73. *t. 28.* 1844–46. TYPE: Colombia, *Hinds* 1841 (K, holotype: K, isotype, neither seen).

Clusia seemanii Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 13: 347. 1860. Based on *Triplandron lineatum* sensu Seemann, non Benth.

Triplandron lineatum Benth. sensu Seemann, Bot. Voy. Herald 88. 1853. TYPE: Colombia, Choco, *Seemann*, not seen.

Clusia cruciata Cuatr., Rev. Acad. Colomb. Ci. Exact. 8: 57. 1950. TYPE: Colombia, *Cuatrecasas 16575* (F, holotype, not seen; US isotype).

Shrub or *tree* to 12 m tall, sometimes epiphytic; twigs drying smooth, yellowish. *Leaves* elliptical, mostly broadest at the middle, mostly 10–20 cm long, 5–10 cm wide, apically acuminate, basally acute, the costa prominent drying only slightly elevated on each side, evanescent about ¾ way up, the lateral veins ascending; sometimes in 2 series, straight or slightly wavy, arcuate near the margin, terminating at an angle into a submarginal vein ca. 1–2 mm from the

margin, the minor venation slightly elevated above, inconspicuous, mostly drying green; petiole distinct, slender, 1–2.5 cm long. *Inflorescences* terminal, few-flowered dichasial cymes; peduncle straight or curved, 1–3 cm long, relatively slender, ca. 3 mm thick, basal bracts not evident; nodes somewhat expanded, bracteoles ca. 2 mm long, drying slightly reddish brown. *Flowers* with the basal bracts clasping, rotund, the margin thin, reddish brown, sepals 4, rotund, the outer pair ca. 7 mm long, keeled, the inner pair shorter; petals 4, decussate, in staminate flowers (Planchon & Triana) the stamens ca. 24 or many, arranged in 2 series or indefinitely coherent, the anthers 2–3–4-locular, longitudinally dehiscent; pistillate flowers not seen. *Fruit* turbinate ca. 2 cm long, the styles conical, the stigmas appearing subsessile.

This species is distinguished by its pointed, petiolate leaves which dry green and appear lineolate by virtue of the slender slightly elevated veins. Its leaves and flower buds are much larger than those of *C. liesneri*.

Use of the name *C. lineata* is based on the annotation of *Wedel 2295* with this name by Maguire. Material available is not sufficient to permit verification of this application of name. Maguire indicated that the type of *Triplandron lineatum* is at Paris (P), but that is not where one would expect to find Seemann types (See Nowicke, 1970).

This species occurs in Panama and Colombia. It occurs at low elevations in wet forests.

BOCAS DEL TORO: Valley of Biarra River, *Seibert 1539* (MO). Isla Colón, *Wedel 884* (MO, US). Water Valley, *Wedel 1906* (MO). Fish Creek Mountains, *Wedel 2295* (MO). CANAL ZONE: Madden Dam area, *Dwyer 8825* (MO). CHIRIQUÍ: Cerro Colorado, 33.1 km beyond bridge over Río San Félix, 1400 m, *Croat 37197* (MO). 1.5 km del campamento Bijao, en Fortuna, *Mendoza et al. 284* (MO). COCLÉ: Río San Juan below junction with Río Tife, 1200 ft, *Hammel 3397* (MO). Cerro Pilón, *Mori 6619* (MO). DARIÉN: Rio Tuqueza, *Bristan 1004* (MO). Río Mortí, *Duke 14129* (MO). VERAGUAS: 16 km NW of Santa Fé on road to Calovébora, 300–500 m, *Mori & Kallunki 6136* (MO). 7 km W of Santa Fé, 2900 ft, *Nee 1158* (MO).

10. **Clusia longipetiolata** Schery, Ann. Missouri Bot. Gard. 29: 362. 1942. TYPE: Panama, *Wedel 1136* (MO, holotype; US, isotype).

Shrub or *tree* to 10 m tall; adventitious roots elongate. *Leaves* ovate or obovate, apically rounded, basally cuneate to obtuse, the costa prominent to near the tip, elevated and broad beneath, the lateral venation slightly ascending, parallel, nearly straight but slightly sinuate, curving at the base and sometimes at the tip, abruptly forming a submarginal vein ca. 1 mm from the margin, stiff, thick, coriaceous; petiole slender, well defined, not winged, 4–8 cm long. *Inflorescence* terminal, few flowered, dichasial, bracts 3–5 mm long, thick, cucullate; peduncle stout, drying slightly flattened, striate; pedicels 5 mm long or obsolete, expanding upwards. *Flowers* (Schery) yellowish white, 5–6 mm wide, the two outer calyx lobes basally connate, the inner 5 coriaceous, broadly rotund; petals thin, ovate rotund, ca. 2.5 cm long, 3 cm wide, staminate flowers with the stamens very numerous inserted on a fleshy annulus around the ovary, filaments obsolete, anthers linear, 3–4 mm long, squarish in cross section; ovary (stigmas) forming a flat central disc 5–7 mm across; pistillate flowers with the androecial receptacle cylindrical, 6–7 mm high, surrounding the ovary; ovary 5-carpellate, pyramidal, the stigmas sessile. *Fruit* not seen.

This species is distinct in its large, coriaceous petiolate leaves which have rounded tips and a submarginal vein very close to the margin. It also has large flower buds, ca. 1 cm across, larger than in other Panamanian species.

Clusia longipetiolata is known only from Panama.

BOCAS DEL TORO: Chiriqui Lagoon, *Wedel 1136* (MO, US). COLÓN: Miguel de la Borda, *Croat 10011* (MO). Santa Rita Ridge road, *Mori & Kallunki 1809* (MO).

11. **Clusia major** L., Sp. Pl. 509. 1753. TYPE: Jamaica, herb. Linn. (LINN 1224.3, left hand specimen, not seen; MO, microfiche).

C. rosea Jacq., Enum. Syst. Pl. 34. 1760; Sel. Stirp. 270. 1763. LECTOTYPE: Catesby, Nat. Hist. Carolina, 2: *t. 99*. 1743.

?*C. retusa* Poir. in Lam., Encycl. Méth. 5: 183. 1804. TYPE: America, herb. Lamarck (P, not seen).

Shrub or *tree* to 20 m tall, sometimes epiphytic; bark smooth; roots warty. *Leaves* broadly obovate, to 15 cm long, 11 cm wide, apically rounded, truncate or emarginate, basally obtuse or broadly cuneate, stiffly coriaceous, the margins drying slightly revolute, the costa elevated above and beneath, more so beneath, and above evanescent upwards, the lateral veins numerous, parallel, ascending at 45–60° to the costa sometimes appearing to be in 2 series, straight below, the apical veins slightly arcuate in the distal ½–¾; petiole stout, drying plane above, 5 mm across, minutely winged and slightly clasping at the base. *Inflorescence* terminal of 1(–2) flowers, peduncle 15–25 mm long, stout, drying 3–4 mm thick, bearing two scale-like cucullate, ovate bracts 5 mm long on the lower half. *Flowers* white or pink, sepals 4(–6), decussate, persistent, coriaceous, the basal sepals becoming 8–10 mm long in fruit, the superior sepals ovate becoming 2–25 mm long and wide in fruit; petals spathulate, caducous, 30–40 mm long; female flower with stamens ca. 15 in clumps of ca. 3, inserted distally in a thin disc; ovary globose, stigmas 6–15. *Fruit* turbinate, 4–5 cm long and broad, smooth, but longitudinally striate, contracted apically to a convex stigmatic area ca. 15 mm across, dehiscing into narrow, coriaceous valves, 4–6 cm long, nearly white, wide spreading and reflexed to expose the seeds; seeds ovoid, white with a scarlet, mucilaginous covering, the embryo with the cotyledons minute, the endosperm scant (lacking?).

This species occurs throughout the Antilles, usually on coastal limestone, but in Panama it has been collected in savannas on the Pacific side of the isthmus.

It is often a free standing but poorly formed tree, and sometimes it occurs as an epiphyte, sometimes strangling the host in the manner of species of *Ficus*. This species may be recognized by its large fruit and coriaceous, broadly cuniform leaves.

Leaves of this species have been used for writing messages and the gum has been used for caulking boats and for medicinal purposes. "Copey."

Although the oldest name in the genus and the name for the type species of the genus (see Britton & Millspaugh, 1920, p. 281), plants have not been given the name *Clusia major* since its first publication until this time. Instead, the later Jacquin name *C. rosea* has been used, probably because the name *C. rosea* is supported by an excellent colored published illustration, and also because in the second edition of the Species Plantarum, Linnaeus himself used the name *C.*

rosea and placed his own *C. major* in synonymy. The herbarium sheet supporting the name *C. major,* LINN 1224.1, bears two leaves, the left hand one of this species and the right hand one of *C. flava* Jacq., annotated "ex H. Jacq.," which is taken to be the holotype of that name. *Clusia flava* occurs in the Antilles and in Nicaragua but has not been found in Panama.

CANAL ZONE: Summit Garden, *Croat 14537* (MO, SCZ). Without other locality (perhaps cultivated, Summit Garden), *Johansen 39* (US). CHIRIQUÍ: Between Boquete and Caldera, *Pittier 3295* (US). San Félix, 0–120 m, *Pittier 5246* (US). COCLÉ: Hills S of El Valle de Antón, 700 m, *Allen 2501* (US). Penonomé, *Williams 224* (US). COLÓN: Near Peluca, *Kennedy 2679* (MO). HERRERA: Lamontosa de Chepo, Las Minas, *Larrasquilla & Lao 337* (MO, PMA). Las Falcones de Las Minas, *Lao 83* (MO, PMA). PANAMÁ: Juan Franco Race Track near Panamá, *Standley 27737* (US). VERAGUAS: Between Santa Fé and Escuela Agricola Alto de Piedras, *Croat 27343* (MO). Without locality, *Goldman 1891* (US).

12. **Clusia minor** L., Sp. Pl. 510. 1753. TYPE: not seen.—FIG. 2A–D.

?*C. venosa* Jacq., Enum. Syst. Pl. 34. 1760; Sel. Stirp. 273. 1763. New name for *Clusia minor* L.
?*C. parviflora* H. & B. in Willd., Sp. Pl. 4: 976. 1806. TYPE: Margarita, not seen.
C. odorata Seemann, Bot. Voy. Herald 89. 1853. TYPE: Panama, Chiriquí, Boquete, *Seemann 1638* (K, not seen).
?*C. pratensis* Seemann, Bot. Voy. Herald 89. 1853. TYPE: *Seemann* (BM, not seen; photo MO).
C. uvitana Pittier, Contr. U.S. Natl. Herb. 13: 452. 1912. TYPE: Costa Rica, *Pittier 12704* (US).
?*C. erectistigma* Maguire, Phytologia 39: 68. 1978. TYPE: Panama, Bocas del Toro, Changuinola, *Maguire & Maguire 61473A* (NY, not seen).

Tree or *shrub* to 7 m tall, sometimes epiphytic; bark of twigs usually exfoliating on the second or third nodes from the tip and appearing yellowish-strigose. *Leaves* ovate, apically obtuse, basally acute, membranaceous, the midvein slightly excurrent beneath, the lateral veins ascending at ca. 30° to the midrib, slightly arcuate in the distal part of the leaf, unbranched, nearly perpendicular to the submarginal vein, the submarginal vein slightly undulate, ca. 0.5 mm from the margin, the margin minutely revolute; resin canals mostly indistinct; petiole 5–15 mm long. Staminate *inflorescence* few flowered; peduncles 3–5 mm long, subtended by a pair of short, ca. 2 mm long, deltoid to ovate bracts; pedicels 5–8 mm long, subtended by a pair of broad bracteoles ca. 2 mm long. Pistillate *inflorescence* of solitary flowers or 1–3 at the terminus of a twig; peduncle 5–8 mm long, about equal to the pedicel; bracts scale-like, minutely or to 10 mm long and foliaceous. Staminate *flowers* with the buds globose, ca. 10 mm across, sepals imbricate, ca. 5 and 4, drying black, petals ca. 15 mm long, rotund; stamens ca. 12 plus some peripheral staminodes, forming a hemisphere with the thecae contrasting light, opening as terminal pores, the pores flush with the flat apical portion; pistillate flowers with the buds depressed globose, ca. 8 mm across; sepals 5–6, imbricate, broadly ovate or rotund, ca. 6 mm long; petals rotund, ca. 15 mm long, waxy, white or flushed with pink; androecium wanting; ovary 6–8 carpellate, the styles sessile, separated in the center by a minute pore, this not enlarging in fruit. *Fruit* ovoid, 25–35 mm long, the stylar crown 8–11 mm across; seeds numerous, axile, ca. 7 mm long.

In Central America, this species has often gone under the name *C. odorata* Seem., which is based on a Panamanian collection. Review of several hundred collections and of the literature has provided no basis for recognizing separate taxons under this name. Recently Maguire (1978) drew attention to the presence

of fruits with longer styles and more erect, protruding stigmas by describing *C. erectostigma* Mag. As these fruits do not appear to be a consistent phenomenon, it is assumed that this is merely a variant condition within the more usual fruits of *C. minor* which have sessile stigmas. Collections cited by Maguire and others noted to have this type of fruit are indicated below with an asterisk. If this fruit type does represent a distinct species, then the name *C. uvitana* Pittier should apply.

Clusia minor is widespread in tropical America, most common in areas with seasonally dry climate such as tropical moist forest, but also occurring on both wetter and drier climes. Maguire (1978) has conjectured, probably correctly, that the species is apomictic in reproduction, and that variants do not represent sexually produced genetic diversity but rather asexual trends.

BOCAS DEL TORO: Almirante, *Cooper 533, 559* (both US). Changuinola Valley, *Cooper & Slater 145* (US). Finca 4 (Delta) 10 mi NW of Almirante, 0–100 m, *D'Arcy 11193* (MO). Río Changuinola near Sursuba, *Dwyer 5139* (MO). Garey Creek SE of Almirante across bay, 80 ft, *McDaniel 5156* (MO). SW of Bocas at Maccaw Hills, *Wedel 552* (MO). Water Valley, *Wedel 741* (MO, US), *814* (MO). Old Bank Island, *Wedel 1969* (US, MO), *2099* (MO). Isla Colón, *Wedel 2480* (MO, US). Snapper Point, Chiriqui Lagoon, *Wedel 2642* (MO, US). Rio Crícamola between Finca St. Louis and Konkintoe, 10–15 m, *Woodson et al. 1897* (MO). CANAL ZONE: Barro Colorado Island, *Bangham 588* (US); *Croat 4925, 5058* (both SCZ), *5412* (DUKE, SCZ), *5434* (SCZ), *6063* (MO, SCZ), *6262* (MO), *6327, 6620* (both MO, SCZ), *7204* (MO), *8376, 13478* (both MO, SCZ), *13829, 14050, 14076A, 14957* (all MO); *D'Arcy & Foster 13311, 13312* (both MO); *Dwyer 1480, 8443* (both MO); *Ebinger 389* (MO, US); *Foster 678* (DUKE), *1422* (DUKE, MO, PMA); *Gentry 1987* (MO, SCZ); *Hayden 141* (MO); *Kenoyer 451* (US); *Montgomery 40, 115* (both MO); *Shuttuck 235, 684, 782, 839, 864* (all MO), *1154* (MO, US); *Woodworth & Vestal 447* (MO); *Christopherson 124* (US). Cultivated, Summit Garden, *D'Arcy 12175* (MO). Near Vigía and San Juan on Río Pequení, 66 m, *Dodge et al. 16574* (MO). Albrook Site, Tropic Test Center, *Dwyer 6551* (SCZ). Summit Gardens, *Mori & Kallunki 1872* (MO). Chiva-Chiva Trail, *Piper 5708* (US). Albrook, U.S. Army Tropic Test Center Site, *Robyns & Dwyer 45* (MO). Quebrada Ancha, 70 m, *Steyermark & Allen 17102* (MO). Fort Clayton, *Tyson et al. 3964* (MO). CHIRIQUÍ: 15–20 km N of San Félix, 3000 ft, *Bort 63* (MO). San Bartolo Limite 8 km W of Puerto Armuelles, 450 m, *Busey 588A* (MO). Tolé, *Dwyer & Kirkbride 7459* (DUKE, MO). Between Santiago and San Félix, 0–100 m, *Folsom & Collins 6917* (MO). Balbuena-David, *Gutiérrez 13* (MO). 12.4 mi N of David, *Lewis et al. 726* (MO). 30.6 km N of Panamerican Highway, San Félix, *Mori & Kallunki 6025* (MO). Caldera, 200–300 m, *Pittier 3349* (US). Between Cerro Vaca and Hato del Loro, 850–1100 m, *Pittier 5377* (US). 1 mi E of Tolé on Panamerican Highway, *Tyson 7299* (PMA). Río Chiriquí Viejo Valley near Volcán, *White 189* (MO). COCLÉ: Upper Río Mata Ahogado, 350 m, *Allen 139* (MO). El Valle de Antón, 600 m, *Allen 2778* (MO, US); *Croat 13286* (MO). La Yeguada, 500–1000 m, *D'Arcy 11281* (MO). El Valle, *Dwyer 1817, 8364* (both MO); *Dwyer & Duke 8278* (MO, SCZ); *Gentry 5621* (MO). 2 mi N of Cerro Pilón, *Liesner 711* (DUKE). El Valle, *Luteyn 1257* (DUKE); *McDaniel 8239* (MO). Between Paso del Arado and Olá, *Pittier 5024* (US). El Valle, *White & White 73* (MO); *Wilbur et al. 15580* (DUKE). Penonomé, *Williams 605* (US). COLÓN: Isla Grande, *D'Arcy 4016* (MO). Río Guanche, *Gentry 6322* (MO). Road to Mosquera from Palmas Bellas, *Mori & Kallunki 1966* (MO). Río Guanche, *Nee 7134* (MO); *Mori et al. 6463* (MO). DARIÉN: El Real, 15 m, *Allen 948* (MO, US). Serrania de Pirre between Río Caná and Río Escucha Ruido, 1000–1310 m, *Croat 37770* (MO). Uruti River, *Duke 226* (MO). Near Pidiaque, *Duke 8056* (MO). Río Chucunaque between Río Membrillo and Río Yaviza, *Duke 8619* (MO, US). Río Balsa between Río Aretí and Manené, *Duke 8779* (MO, US). Río Mortí, *Duke 14131* (MO). Puerto Santa Dorotea, *Dwyer 2271* (MO). Manené to mouth of Río Cuasí, *Kirkbride & Bristan 1501* (MO). 4.5 mi S of El Real, *Mori & Kallunki 5419* (MO). HERRERA: Ocú, *Allen 4067, 1059* (both MO). Chepo de las Minas, 700 m, *Folsom et al. 7047* (MO). Las Falconas de las Minas, *Lao 82* (MO, PMA). Ocú, *Stern et al. 1685* (MO, US). 4 mi S of Los Pozos, *Tyson 2693* (MO, SCZ). 10 mi S of Ocú, *Tyson et al. 2816* (MO, SCZ). PANAMÁ: Between Arraijan and La Chorrera, *Dodge et al. 16733* (MO). Río Chagres 1 mi above Madden Lake, *Duke 4472* (MO). Between El Llano and Río Manoní, *Duke 5632* (MO). Cerro Campana, *Duke 8669* (MO, US). San Jose Island, *Harlow 61* (US); *Johnston 59* (US). Near Tapia River, Juan Diaz region, *Maxon & Harvey 6703* (US). San Jose Island, *Miller 1924* (US). Belle Vista, *Piper 5358, 5366* (both US). Near Guayabito, *Smith & Smith 3458* (MO, US, PMA). Big swamp E of Río Tocumen, *Standley 26689* (US). Río Tapia, *Standley 28198* (MO). Cerro Azul, 2000 ft, *Tyson 2117* (MO, SCZ). San Jose Island, *Tyson & Loftin 5085* (MO, SCZ). Cerro Campana, *Tyson & Lazor 6230* (PMA).

13. **Clusia oedematopoidea** Maguire, Phytologia 39: 73. 1978. TYPE: Panama, *Duke 13557* (NY, holotype; MO, isotype).

Tree or *epiphytic* vine or shrub; trunk fluted; twigs angled. *Leaves* elliptical, slightly broader above the middle, 8–20 cm long, 4–9 cm wide, apically acuminate with a pronounced drip tip, basally rounded or obtuse, slightly dimidiate, the costa elevated in the proximal quarter above and to the tip beneath, lateral venation plane, arcuate, distant, forming a submarginal vein to 5 mm from the margin, inconspicuously lineolate above and beneath, coriaceous, sometimes drying discolorous, slatey above and pinkish brown beneath. *Inflorescences* cymose panicles to 15 cm long; peduncles to 7 cm long, angled and often exfoliating; leaves subtending the inflorescence sometimes slightly reduced; bracteoles inconspicuous, ca. 2 mm long, cucullate; pedicels ca. 2 mm long, drying sharply angled. *Flowers* (Maguire) with sepals 4, decussate, 2 mm long, abruptly acute. *Fruit* broadly ellipsoidal, 1.5–2 cm long, the stigmas 4, sessile; seeds (Maguire) ca. 4 mm long, 1.5 mm wide, striate, completely enveloped in a membranaceous sac.

This species may be recognized by its large, stiff ellipsoidal leaves which have a well developed drip tip and well spaced arcuate veins which are plane with the leaf surface. The often visible lineolate pattern is also distinctive.

DARIÉN: Río Balsa between Río Aretí and Manené, *Duke 8780* (MO). Río Balsa between Manené and Tusijuanda, *Duke 13557* (MO). Río Balsa between Manené and Guayabo, *Duke & Nickerson 14938* (MO). Manené to mouth of Río Cuasí, *Kirkbride & Bristan 1445* (MO). PANAMÁ: El Llano-Cartí road 18 km from Panamerican Highway, *Mori et al. 4587* (MO); *Nee & Tyson 10985* (MO).

14. **Clusia osseocarpa** Maguire, Phytologia 39: 74. 1978. TYPE: Panama, *Liesner 1285* (MO, holotype).

A *shrub* or *tree*, to 7 m tall, often epiphytic. *Leaves* broadly ovate to subcircular, mostly 9–15(–20) cm long, 7–12(–13) cm wide, apically rounded, basally obtuse or rounded, the costa prominent about ⅔ way up, elevated beneath, the lateral veins close, parallel, ascending, nearly straight, arcuate distally terminating in a distinct submarginal vein; thick, rigidly coriaceous; petiole distinct, unwinged, 2–4 mm long. *Inflorescences* axillary to the terminal leaves, short dichasial racemes, to ca. 6 cm long, bracts and bracteoles conspicuous, flaring, cucullate, 2–3 mm long; pedicels 0–3 mm long, stout; bracteoles subtending the flowers 4, decussate. *Flowers* (buds) with sepals 4, decussate, abruptly acute. *Fruit* ellipsoidal, or ovoid, ca. 1.5 cm long, dehiscing into 4 valves; seeds 2 per locule, 4 mm long.

This species closely resembles *C. palmicida* Pl. & Tr. of Venezuela, Trinidad and the Guianas, but the fruit of that species is much larger, 5–8 cm across. It is distinguished from other Panamanian species of *Clusia* by its broad, stiff leaves and the parallel venation which ends abruptly at the submarginal vein, much as in *C. longipetiolata*. However, in *C. longipetiolata* the leaf shape is quite different.

DARIÉN: Top of Cerro Mali, 1400 m, *Gentry & Mori 13673* (MO). Puerto Sta. Dorothea, *Dwyer 2215* (US). PANAMÁ: 3 mi before Goofy Lake, Cerro Jefe, *Correa 717* (MO). El Llano Cartí road,

Croat 33706 (MO). Cerro Jefe, *Mori & Kallunki 2769* (MO); *Tyson 3438* (MO, SCZ). SAN BLAS: El Llano to Cartí road, 300–500 m, *Liesner 1285* (MO).

15. **Clusia rotundata** Standley, Field Mus. Hist. Bot. Ser. 18: 706. 1937. TYPE: Costa Rica, *Standley 43107* (US).

?*C. palmana* Standley, Field Mus. Hist. Bot. Ser. 18: 705. 1937. TYPE: Costa Rica, *Standley 32906* (US, holotype; F, isotype).
?*C. longistyla* Cuatr., Rev. Acad. Colomb. Ci. Exact. 8. 1950. TYPE: Colombia, *Cuatrecasas 17192* (US, isotype).

Tree or *shrub*, often epiphytic, sometimes strangling, latex yellow. *Leaves* obovate, apically rounded or broadly obtuse, basally cuneate, 4–10 cm long, 3–6 cm wide, the costa elevated basally, sometimes on both sides, evanescent distally, the lateral nerves distinct, parallel, ascending, gradually becoming arcuate near the margin, abruptly forming a fine submarginal vein 1–3 mm from the margin, a marginal vein sometimes present, stiff coriaceous; petioles broad, mostly indistinct. *Inflorescences* terminal cymose panicles, mostly condensed, bracts keeled, ca. 5–12 mm long, or foliaceous, narrowly obovate, ca. 4 cm long; peduncle stout, ca. 5 mm thick; bracteoles evident, 1–2 mm long, sometimes 1–3 pairs lacking a short distance below the flowers; pedicels stout, 2–4 mm long but appearing obsolete. *Flowers* with the buds globose, sepals (?bracts) 2, much shorter than the bud or nearly equalling it; petals pink and white, 4–6. *Fruit* subglobose to turbinate, ca. 2 cm long, the styles free, briefly connivent into a stipe 5 mm long and 2–3(–6) mm thick, diverging and slightly outcurved, slightly below the stigmas, the stigmas 2 mm long; seeds numerous, immersed in a yellow pulp.

This species is distinct amongst the Panamanian *Clusia* in its sessile, coriaceous leaves which are usually somewhat larger than those of *C. coclensis* and smaller than those of other species with sessile coriaceous leaves. The submarginal nerve is usually evident from above, and sometimes a marginal vein is also visible. The lateral venation of the leaf uppersides is usually distinct and readily visible in dried material. The fruits of *Clusia rotundata* appear to be somewhat smaller than many other species of *Clusia*, and the Panamanian material studied is all characterized by the united fascicle of styles which bear the small stigmas on slightly divergent style apices. The styles on the type material of *C. palmana* Standley are spread apart, perhaps as a result of pressing, and the styles of *C. longistyla* Cuatr. are much narrower and no longer placed together, but perhaps these two collections are conspecific with *C. rotundata*. *Clusia clusioides* (Griseb.) D'Arcy[7] of the Antilles is a very similar species, but on a limited range of

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[7] *Clusia clusioides* (Griseb.) D'Arcy, comb. nov. Based on *Tovomita clusioides* Griseb., Pl. Wright. 1: 166. December 1860, non Camb. ex Pl. & Tr. (1828) nomen nudum. TYPE: Cuba, *Wright 1121*, not seen. *Chrysochlamys clusioides* (Griseb.) Griseb., Cat. Pl. Cub. 37. 1866. *Tovomita grisebachiana* Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 284. 1860. New name for *Tovomita clusioides* Griseb., non Camb. *Clusia krugiana* Urban, Symb. Ant. 1: 367. 1899. TYPE: not seen. *Clusia grisenbachiana* (Pl. & Tr.) Alain, Contr. Ocas. Mus. Hist. Nat. Coleg. "De La Salle," no. 12: 6. 1953. The fact that Planchon & Triana refer to Grisebach's publication of *Tovomita clusioides* is taken as evidence that Grisebach's publication appeared first.

material seen from Cuba and Puerto Rico, the stigmas are sessile on slightly smaller fruits. If this Antillean species is conspecific with the Panamanian plants described here, then *Clusia clusioides* would be the correct name.

In Panama, the species occurs mainly in low elevation moist and wet forests Although now definitely known only from Panama and Costa Rica, this species may in fact be quite widespread.

BOCAS DEL TORO: E slope of La Zorra, *Kirkbride & Duke 804* (MO). CANAL ZONE: Boy Scout Road, Madden Dam area, *Dwyer 8825* (MO). CHIRIQUÍ: Cerro Horqueta, 7000 ft, *Blum & Dwyer 2609* (SCZ). Above Río San Félix near town of San Félix, 800–1200 m, *Croat 33472* (MO). Cerro Colorado, 33.1 km beyond bridge over Río San Félix, 1400 m, *Croat 37197* (MO). Volcán, *D'Arcy 10879* (MO). Cerro Colorado, 1700 m, *Folsom 4890* (MO). 1.5–2 km del campamiento Bijao-Fortuna, *Mendoza et al. 283, 284* (both MO). COCLÉ: La Yeguada, 500–1000 m, *D'Arcy 11280* (MO). Top of El Petroso, N of El Copé, *D'Arcy 11342* (MO). Cerro Pilón, *Duke 12114* (MO). Alto Calvario 7 km N of El Copé, *Folsom & Robinson 2368, 3173, 6471* (all MO). Cerro Pilón, *Mori et al. 6619* (MO). COLÓN: Río Guanche, 2.5 km upriver from road to Portobelo, *Mori et al. 6472* (MO); *Mori & Witherspoon 7970* (MO). DARIÉN: Río Balsa between Manené and Cuayabo, *Duke & Nickerson 14943* (MO). Cerro Toupee just S of Cerro Pirre, *Folsom 4507* (MO). Top of Cerro Mali, 1400 m, *Gentry & Mori 13673* (MO). PANAMÁ: Cerro Campana, 800 m, *D'Arcy 11132* (MO). Cerro Campana, *Gentry (Bacchus) 5058* (MO). El Llano-Cartí road, 500 m, *Busey 904* (MO). La Eneida, 700 m, *Correa & Dressler 968* (MO). Cerro Jefe, *Croat 17347* (MO); *D'Arcy 11387, 12190* (both MO); *Duke 9400* (MO); *Dwyer 4358* (MO); *Folsom et al. 1960, 2511* (both MO). Cerro Campana, 800 m, *Lazor 3329* (DUKE, PMA, SCZ). El Llano-Cartí road, 300–500 m, *Liesner 1273* (MO); *Mori & Kallunki 5575* (MO). Cerro Jefe, *Mori & Kallunki 6086* (MO); *Mori 7126* (MO). El Llano-Cartí road, *Nee & Tyson 10972* (MO). Cerro Campana, *Tyson 7373* (PMA). SAN BLAS: El Llano-Cartí road, *Liesner 1263* (DUKE, MO, US). VERAGUAS: NW of Santa Fé, 8.8 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 6167* (MO).

16. **Clusia salvinii** Donn. Smith, Bot. Gaz. (Crawfordsville) 35: 1. 1903. TYPE: Guatemala, *Salvin 1892* (*Donnell Smith 2530*) (US).

Tree or *shrub* to 8 m tall, sometimes epiphytic, twigs stout, drying deeply furrowed, hollow, ultimate twigs often drying reddish with minute transverse exfoliation. *Leaves* large and coriaceous, obovate, apically rounded, basally cuneate and narrowed into the winged petiolar region; the costa prominent but somewhat evanescent distally, the lateral veins numerous, ascending, straight except at the margin, sometimes appearing in two series, the minor venation obscure; petiole wanting, the petiolar area winged and cucullate, the wings continuing into the stem area and connate there. *Inflorescences* terminal, several–many-flowered condensed cymose panicles held above the foliage, peduncle stout, straight, to ca. 9 cm long, sometimes branched, the elements subtended by thick cucullate, clasping bracts 2–3 cm long, 1–1.75 cm wide the inflorescences thus appearing umbellate or whorled; pedicels obsolete, each bearing a broad bract 5–7 mm long. *Flowers* white, slightly fragrant, 12–15 mm across; buds greenish white, ellipsoidal, sepals ca. 4, rotund, about equal, remaining in the shape of a cup, the margins thin, ca. 7 mm long; petals 5–6, overtopping the stamens in bud, expanding to about twice as long as the sepals; stamens numerous (ca. 52), 4–5 mm long, the filaments rudimentary, the connective conspicuous, inserted on a convex receptacle 3–4 mm across, in pistillate flowers the androecium reduced to 5 distinct short obtuse teeth; ovary turbinate, the 5–6 carpels fused to near the top or free more than halfway down, the stigmas dark, proximal to form a cone on top of the ovary, the ovules numerous. *Fruit* turbinoid to subcylindrical, 2.5–3 cm long, 1.5–2 cm wide, the valves white inside, opening

to display the seeds which are aggregated in caducous, orange covered ellipsoidal masses.

This species may be recognized by its large, sessile coriaceous leaves, large, tightly clustered fruits and orange seed bodies.

In Panama the species grows in cloud forests of low to middle elevations. Usually it occurs as a small free-standing tree, but various collectors note it as an epiphyte. Anthers examined on several collections revealed little or no fully formed pollen, suggesting that the species is apomictic.

The name for this species is subject to debate. The type of *C. salvinii* has only one small leaf which is not at all typical of the large leaves seen on most Panamanian material. Also, the Panamanian plants have sessile anthers rather than the well-defined filaments about ⅓ as long as the anthers on the type. There are also a number of earlier names from South America which may apply to this species, e.g. *C. multiflora* H.B.K. (1822). Although photos of the types of some of these names have been studied, it is not possible to verify that they are conspecific with the Panamanian material without examination of the actual type specimens.

BOCAS DEL TORO: Between Pinola and divide on Ciriquicito-Caldera Trail, *Kirkbride & Duke 850* (MO). CHIRIQUÍ: Llano del Volcán, 1500 m, *Allen 3500* (MO). Cerro Horqueta, 7000 ft, *Blum & Dwyer 2609, 2610* (MO). 5 km del Hato de Volcán en el camino a Las Lagunas, *Correa & Lazor 1448* (MO). Las Nubes, 2000 m, *Croat 26451* (MO). E of Boquete and on Cerro Azul near Quebrada Jaramillo, 1620–1700 m, *Croat 26882* (MO). Cerro Colorado on upper mining road 20–28 mi from San Félix, *Croat 33340* (MO). Bajo Corro, 6000 ft, *Davidson 232* (MO), *324* (MO, US). Llanos del Volcán, *Hess*, August 1947 (US). Palmira, Boquete, *Lao 366* (MO, PMA). Cerro Hornitos 40 km W of Gualaca, *Mori & Bolton 7489* (MO). N of San Félix at Chiriqui-Bocas del Toro border, *Mori & Kallunki 5966, 5991* (both MO). Cerro Colorado 50 km N of San Félix, 1200–1500 m, *Mori & Dressler 7766* (MO). 18 km N of San Félix on new road to Cerro Colorado copper mines, 1000 m, *Nee 10714* (MO). 3 mi N of El Volcán on old lava flow, 5000 ft, *Tyson 5845* (MO, SCZ). El Volcán on old lava flow 1 mi from town, 4000 ft, *Tyson 7377* (PMA, MO). 5 mi NE of El Hato del Volcán, *Wilbur et al. 11869* (DUKE). COCLÉ: El Valle, *Correa 312* (SCZ). Mesa below Cerro Pilón, *Croat 14364, 25421* (MO). Cerro Caracoral, 1000 m, *Duke & Dwyer 15093* (MO); *Kirkbride 1093* (MO). La Mesa, N of El Valle, *Mori 6608* (MO); *Nee & Dwyer 9151* (MO); *Wilbur & Luteyn 11744* (DUKE). COLÓN: Río Guanche, *Mori & Kallunki 5193* (MO). DARIÉN: Cerro Pirre, *Duke 6558* (MO); *Folsom 4508* (MO). Cerro Mali, 1400 m, *Gentry & Mori 13679, 13837* (both MO). Cerro Tacarcuna massif, 1500–1850 m, *Gentry & Mori 13992, 14153* (both MO). Cuasí-Cuná Trail between Cerro Campamento and La Escalera, E of Tres Bocas, *Kirkbride & Duke 1283* (MO, SCZ). PANAMÁ: Cerro Jefe, *Busey & Croat 282* (MO); *D'Arcy 11373, 12189, 12191* (all MO); *Duke 8179* (MO); *Dwyer et al. 7290* (MO, SCZ), *Dwyer & Stimson 8062A* (MO); *Folson & Harp 1375* (MO); *Folsom et al. 2512* (MO); *Gentry 2870* (MO); *Gómez-Pompa et al. 3071* (MO); *Mori & Kallunki 3617, 6079* (MO); *Tyson et al. 3243* (MO, SCZ), *Tyson 3543* (SCZ); *Tyson et al. 4357* (MO, SCZ); *Wilbur & Teeri 13646* (DUKE). VERAGUAS: N of Santa Fé, summit of Cerro Arizona, *Hammel 4729* (MO).

17. **Clusia stenophylla** Standley, Field Mus. Nat. Hist. Bot. Ser. 4: 235. 1929. TYPE: Panama, Bocas del Toro, Bocas del Toro Island, *Cooper 468* (F, not seen).

Shrub or *tree*, mostly epiphytic; twigs stout, drying reddish, angled. *Leaves* obovate to elliptical, 10–20 cm long, 5–10 cm wide, apically rounded, basally narrowed, the costa plane above, conspicuous and thick beneath, the lateral veins arcuate, ascending, distant, chartaceous, drying discolorous, slatey above, reddish brown beneath; petioles distinct, stout, 1–2 cm long, narrowly winged. *Inflorescences* terminal cymose panicles, peduncles stout, angled, drying somewhat

reddish, 1.55 cm long; bracts wanting; bracteoles obsolete. *Flowers* (Standley) with sepals 4, decussate, narrow, the outermost broadly ovate or rotund, 8 mm long and wide, apically rotund, the inner pair 10–11 mm long, 5–7 mm wide, oval, apically rounded; petals 4, subequal, oblong ovate, ca. 2 mm long, 7 mm wide, apically rounded, thin, the receptacle 2.5 mm long, stipitate, 2 mm thick; stamens ca. 100, anthers oblong, 1.5 mm long, apically rotund, the filaments free, the anthers subequal, thick, glabrous. *Fruit* unknown.

The species described here may be recognized by its large, petiolate leaves which have rounded apices and dry slatey, sometimes shiny above and dull beneath. The petioles are narrowly winged to the base.

Application of the name *Clusia stenophylla* to the material cited here is based on Maguire's annotation of *Correa & Dressler 736* with that name. Standley's description mostly agrees with these plants. Standley noted fragrant, white flowers, and yellow, sticky sap.

COCLÉ: Inside crater of El Valle de Antón, 1000 m, *Wilbur et al. 11155* (DUKE). COLÓN: Al este de zona montañosa de Santa Rita, *Correa & Dressler 736* (MO).

3. CLUSIELLA

Clusiella Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 253. 1860. TYPE: *C. elegans* Pl. & Tr.

Asthotheca Miers ex Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 254. 1860. Published without species and not definitely accepted by Pl. & Tr., based on: Brazil, *Spruce 2159 & 2854*, neither seen.
Clusia subg. *Criuva* sect. *Asthotheca* Miers ex Benth. & Hook., Gen. Pl. 1: 170. 1862.
Astrotheca Miers ex Vesque, Epharm. 3: 80, 81. 1892; in A. & C. DC., Monogr. Phan. 8: 171. 1893. pro. gen. orth. mut.

Epiphytic *shrubs*, perhaps dioecious. *Leaves* elliptical, mostly acuminate, drying discolorous, the lateral veins slightly arcuate, anastomosing to form a submarginal vein; petioles short. *Inflorescences* short, strict or basally branched, the peduncles with successive pairs of scale-like bracts. *Flowers* with 5 sepals, imbricate; petals 5, rotund, quincuncial, rotund, greatly exceeding the sepals; stamens wanting in pistillate flowers, the androecium consisting of a fleshy mass with numerous partly fused staminodes at the periphery, the ovary 4–5-locular, the ovules numerous, staminate flowers unknown. *Fruit* a small berry.

This genus of 1–4 species is confined to wet forests of Panama and northern South America. It is usually easily recognizable by its ovate, acuminate, subsessile leaves which dry discolorous. Material has not been available to provide good descriptions of fruits or flowers of both sexes in all species.

1. **Clusiella elegans** Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 253. 1860. TYPE: Colombia, Chocó, Triana (P, not seen; W, isotype, not seen; MO, photo).—FIG. 3.

Epiphytic *shrubs*, perhaps dioecious; twigs slender, branching. *Leaves* narrowly ovate, apically acuminate, basally rounded or obtuse, mostly 6–9 cm long, 2–4 cm wide, the lateral veins inconspicuous, slightly arcuate, anastomosing to

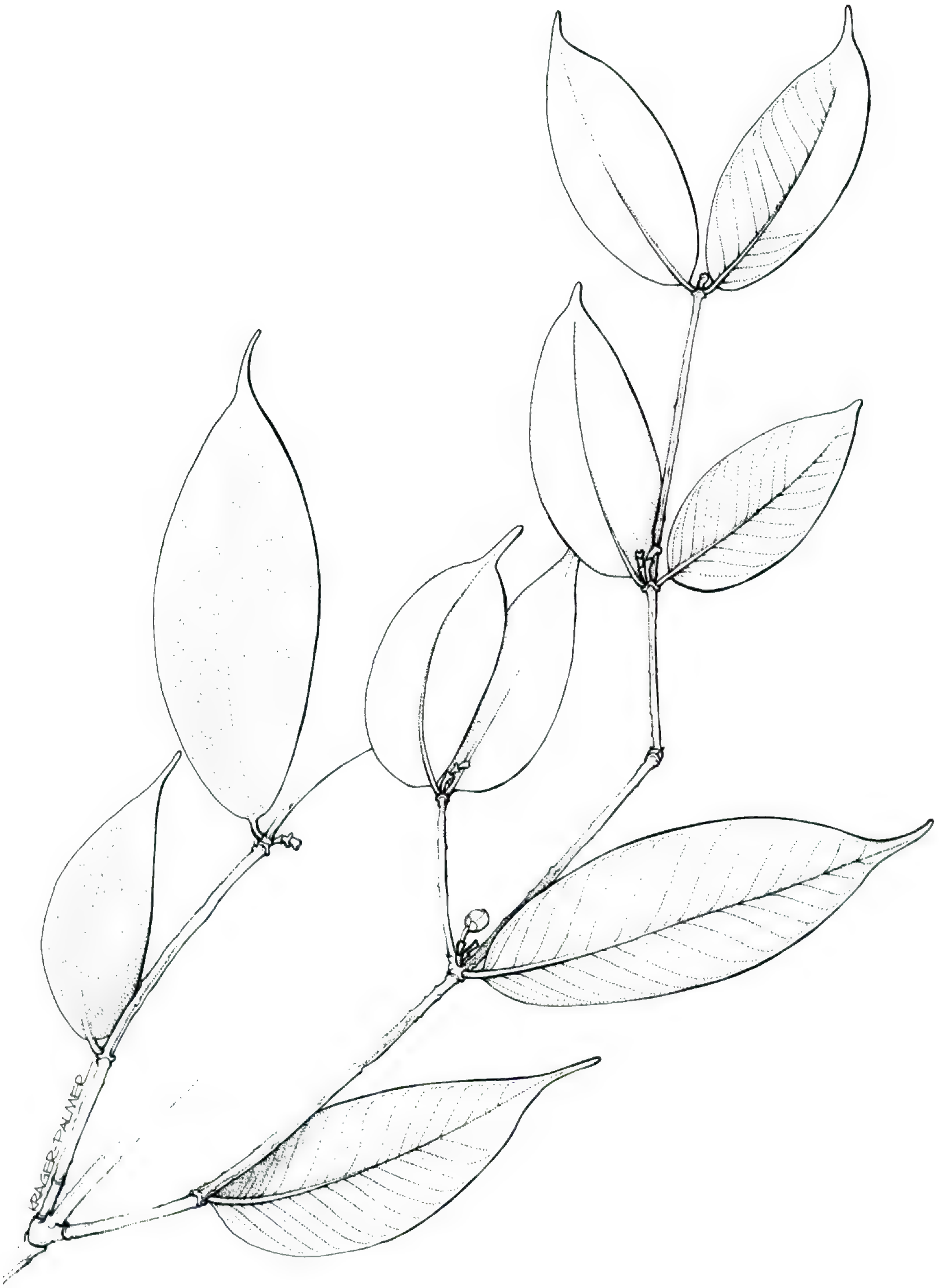

FIGURE 3. *Clusiella elegans* Pl. & Tr.—Habit (×½). [After *Mori & Kallunki 3875* (MO).]

form a submarginal vein near the margin, the margins often drying slightly revolute, discolorous, often drying gray or silvery above, matte and yellowish to reddish brown beneath; petioles mostly ca. 3 mm long, often drying darker than the leaf. *Inflorescences* terminal or axillary, short, strict or sparingly branched at the base, the peduncles with 1–many pairs of short, cucullate bracts to ca. 1 mm long, the internodes to ca. 3 mm long, angled; pedicels 2–3 mm long. *Flowers* fragrant, ?white or pinkish, ?sometimes with yellow; buds globose or ovoid, to ca. 7 mm long; sepals 5, imbricate, ca. 2 mm long rotund, with thin margins; petals 5, quincuncial, rotund, several times larger than the sepals; stamens unknown, in pistillate flowers the androecium reduced to a fleshy body almost covering the ovary with ca. 2 series of staminodes at the periphery, the staminodes ca. 20, connate but free apically; ovary ovoid or turbinate, 4–5-locular, surmounted by thickened stylar and stigmatic wing-like processes, the ovules numerous. *Fruit* fleshy, ?white, ca. 6 mm long.

This species ranges from Central America to Peru, occurring as an epiphyte in wet lowland forests. Details of the staminate flowers and fruit are not reported, and details of the flower recorded above are taken from Vesque (1893). Collection notes on flower color are not in agreement, recording light pink, white and white with yellow collar at base of ovary.

DARIÉN: Upper gold mining camp of Tyler Kittredge, headwaters of Río Tuquesa 2 mi from Continental Divide, *Croat 27213* (MO). PANAMÁ: El Llano-Cartí road, *Croat 22894* (MO); *Kennedy et al. 2394, 2397A* (both MO); *Liesner 658, 1208* (both MO); *Mori et al. 4701, 4705* (both MO). VERAGUAS: NW of Santa Fé, 11 km from Escuela Agricola Alto de Piedra, 450–550 m, *Mori et al. 3875* (MO).

4. DYSTOVOMITA

Dystovomita (Engler) D'Arcy, Ann. Missouri Bot. Gard. 65: 694. 1978.

Tovomita sect. II *Dystovomita* Engler, Bot. Jahrb. 58 Beibl. 130: 8. 1923. TYPE: *Tovomita pittieri* Engl. ≡ *Dystovomita pittieri* (Engl.) D'Arcy.

Glabrous dioecious *trees*. *Leaves* opposite, entire, the costa prominent, the lateral veins slightly arcuate, evenly spaced, the minor venation inconspicuous; petioles stout; axillary structures drying hard, dark, conspicuous. *Inflorescences* lateral on the stems or terminal, sessile, fascicled, cymose panicles; minute bracts and bracteoles present. *Flower* buds globose or ovoid, sepals 2–4, the outer pair sometimes reduced to minute appressed scales (?bracts), the inner pair imbricate or fused in bud, opposite, decussate; petals 4, imbricate and overtopping the bud; stamens numerous, the filaments free or appearing as if in fascicles, anthers terminal, 2-lobed along the sides of the filament apex, 4-loculed; ovary 3–5-locular, the styles short or wanting, reflexed over the ovary, the stigmas ligulate or spathulate, adaxial and hence facing outwards from the ovary, the ovules 1–2 per locule, pendant, the axil affixed to the upper ¾ of the placental column, the second ovule when present partly superposed. *Fruit* a small apically dehiscent berry, outer bracts persistent but other perianth parts deciduous; seeds faboid, striate, exarillate with a convex, discoid, hard caruncle.

Dystovomita, with 3 species of trees in tropical America, is distinct in its

basifixed pendent ovules, often partly fused perianth, and the conspicuous structures axillary to the leaves.

1. **Dystovomita pittieri** (Engler) D'Arcy, Ann. Missouri Bot. Gard. 65: 695. 1978.

Tovomita pittieri Engler, Bot. Jahrb. 58 Beibl. 130: 8. 1923. TYPE: Costa Rica, *Pittier 16094* (US).
Chrysochlamys clusiaefolia ssp. *panamensis* Maguire, Phytologia 36: 395. TYPE: Panama, *Gentry & Mori 13769* (MO).

Tree to 10 m tall; twigs stout, terete, leaf scars half encircling the stem, semicircular to slightly crescentic. *Leaves* opposite, at least terminally, broadly elliptical, the blades to 25 cm long, 20 cm wide, apically rounded or short-obtuse, basally obtuse or short-acuminate, the margins minutely revolute, the costa prominent, slightly elevated above, more so beneath, lateral veins 12–15 on each side, parallel, evenly spaced, slightly ascending, loop connected at the margin and forming a subcontinuous, obscure submarginal vein; minor venation quite obscure, consisting of 2–4 pinnate veins arising at the costa intermediate between the lateral veins, these with cross veins forming a rectangular reticulum; coriaceous to chartaceous; axillary buds lignified, cucullate, apically rounded to 10 mm long. *Inflorescences* borne on mature wood, cauliflorous, perhaps axillary to fallen leaves, sometimes numerous, many-flowered, peduncles slender, paniculate, drying angled, the dichotomies subtended by minute, cucullate bracts, pedicels 1–2 mm long, drying quadrate. *Flowers* small, the buds subglobose, ca. 3 mm long; sepals 2, opposite, scalelike, reaching about halfway up the bud, sometimes wide-spreading, perhaps persistent; corolla imbricate, the petals 4, in bud the inner petal completely covering and enveloping the stamens; stamens numerous, (ca. 48) free, in several undefined whorls, the filaments stout, apically contracted, anthers of 4 terminal discrete, similar locules, prismatic, the connective not expanded or evident; ovary pyriform, the 4 styles slender, erect, somewhat distant, the stigmas subpeltate, rotund, little wider than the styles; ovules 2 per locule, partly superposed, the raphe ascending, axile, an enveloping ? raphe present.

The above description is taken from *Gentry & Mori 13769* (MO-2259769) which agrees with *Pittier 16094* (US) in all external respects. Known only by a few collections, the fruit of this species and its fully opened flowers are unknown. It is not clear whether the flowers are perfect or not. The axillary buds, referred to by Maguire as stipules, are diagnostic; they form a mouthlike pair of indurated structures in the leaf axils. The venation is also singular, except for the costa and main lateral veins, no venation is evident on most leaves; when examined internally, the rectangular reticulum noted above is perceived. At the margins, the major veins loop back evenly to form a looping anastomosing submarginal vein and continue to evanesce in a discontinuous marginal vein. This species may lack the milky sap usually characteristic of the family.

Dystovomita pittieri is known from Costa Rica, Panama and Choco Department in Colombia: Hills behind logging camp below first rapids on Río Truando, 40–200 m, *Duke 13320* (MO). Top of Serrania del Darién E of Unguia, 1,400 m, *Gentry et al. 16775* (MO).

In Costa Rica it was found at ca. 1,000 m just SE of Turrialba, while the Panamanian localities are on the Serriana del Darién at 1,000–1,400 m.

DARIÉN: Cerro Mali base camp, Colombian border, 1400 m, *Gentry & Mori 13769* (MO). Elfin forest, Cerro Caracoral, 1000 m, *Duke & Dwyer 15102* (MO).

5. GARCINIA

Garcinia L., Sp. Pl. 443. 1753; Gen. Pl. ed. 5. 202. 1754. TYPE: *G. mangostana* L.

Cambogia L., Gen. Pl. ed. 5. Adde. 1. 1754. TYPE: *C. gutta* L. ≡ *Garcina gutta* (L.) Wight.
Coddampuli Adans., Fam. 2: 445. 1763. Based on *Cambogia* L.
Biwaldia Scop., Introd. 232. 1777. Based on *Garcinia mangostana* L.
Dactylanthera Welw., Apomt. Phytogeogr. in Ann. Conselh. Ultramar. 560. 1858.
Clusianthemum Vieill., Bull. Soc. Linn. Normand. 9: 338. 1865. TYPE: *C. pedicellatum* Vieill.

Erect *shrubs* or *trees*, mostly glabrous; sometimes dioecious or polygamous; sap yellow or white. *Leaves* opposite, simple, entire, mostly coriaceous with a prominent costa, lateral veins numerous, parallel, somewhat arcuate, becoming reticulate near the margin and forming a submarginal vein at or near the margin; petioles sometimes stout usually with an axillary wedge of tissue forming a pit; stipules wanting. *Inflorescences* fasciculate in the leaf axils or solitary and terminal, mostly small, pedicellate; bracts wanting or inconspicuous. *Flowers* perfect or unisexual, sepals 2–4(–5), decussate, coriaceous, mostly imbricate; petals 2–4(–6), white, yellow or red; stamens numerous, inserted in one or more whorls or clusters, connate or free, the anthers variously dehiscent, rudimentary or wanting in pistillate flowers; ovary inserted in an annular disc, mostly ovoid, the style usually short and stout, sometimes obsolete, the stigmas 3–12, coherent to form an entire or sinuate cap over the style, carpels 2–12, one erect ovule in each. *Fruit* a leathery berry or drupe, mostly 1 celled, the rind sometimes thick, smooth or tuberculate, the mesocarp often juicy and sweet; seeds 1–3, arillate, mostly ellipsoidal; embryo minute.

Garcinia includes 400–500 species occurring in most tropical countries. Trees are commonly in the forest understory in wet regions. Many species have comestible fruits, and a number of them have sap useful for medicine or other purposes.

Garcinia embraces three quite distinct subgenera, subg. *Garcinia*, subg. *Xanthochymus*, and subg. *Rheediopsis* (Vesque, 1893). In subg. *Rheediopsis* sect. *Rheediopsis*, the stamens are free or united into 4 groups, and the flowers are 4-merous. This subgenus is confined to Africa. Many other features of these plants are suggestive of *Rheedia*, and this subgenus should probably be removed from *Garcinia* and placed in *Rheedia*, which is otherwise confined to Madagascar and the Neotropics. In subgenus *Xanthochymus*, flowers are 5-merous, and the stamens are united in 4–5 fascicles in contrast to subg. *Garcinia* where there are many elaborate configurations of the stamens, and flowers are usually 4-merous. Leaves of *Garcinia pictorius*, the type of subg. *Xanthochymus*, are much like those of some species of *Rheedia*, e.g. *R. lateriflora* and *R. macrophylla*, and unlike those of *G. mangostana*, the type of subg. *Garcinia*, especially with re-

spect to venation. In this treatment, *Rheedia* is recognized as distinct from *Garcinia*, but disposition of the Old World groups is left to those working with those plants.

Literature:

Maheshwari, J. K. 1964. Taxonomic studies on Indian Guttiferae. III. The genus *Garcinia* Linn. s. l. Bull. Bot. Surv. India 6: 107–135.

a. Fruits with the stigmas forming a flat sessile cap, purplish brown; sepals and petals 4; leaves mostly broadest above the middle (subgenus *Garcinia*) ..... 1. *G. mangostana*
aa. Fruits apiculate, yellow; sepals and petals mostly 5; leaves mostly broadest below the middle (subgenus *Xanthochymus*) ..... 2. *G. pictorius*

1. **Garcinia mangostana** L., Sp. Pl. 443. 1753. TYPE: Indonesia, ?Hort. Cliff. (BM, not seen).—FIG. 4B.

Glabrous dioecious *tree* to 10 m tall, slow growing; sap yellow; twigs stout, drying yellowish and sulcate-ridged. *Leaves* elliptical, thick, coriaceous, 12–20 cm long, 6–9 cm wide, apically acute or obtuse with a short, falcate acumen, basally obtuse or acute, the margin thick, often slightly revolute, the costa prominent, plane or slightly elevated above, sharply angled and elevated beneath, the lateral veins ca. 3 per cm, including minor veins, becoming reticulate ca. ⅔ way to the margin, elevated on both sides, forming a submarginal vein ca. 5 mm from the margin and sometimes a second submarginal vein nearer the margin; petiole stout, drying yellow sulcate but different in texture from the twigs, 15–25 cm long. *Inflorescences* (Panama) solitary terminal flowers; pedicels stout, drying yellowish, sulcate, ca. 15 mm long. *Flowers* (female only) with sepals 4, pinkish or red, coriaceous, decussate, slightly overlapping in bud, ca. 15 mm long, broadly rotund, cucullate, persistent; petals 4–5, yellowish, white or reddish; stamens rudimentary, inserted in 4 clusters above the short disc, the filaments partly united, the anthers dehiscing longitudinally, pollen reduced or wanting, the connective conspicuous; ovary ovoid or globose, the stigmas yellowish-white, 3–6, coherent, forming a hemispherical cap on top of the ovary. *Fruit* deep purple, 3.5–5 cm across, globose, truncate at the persistent stigmas, the rind thick; seeds 1–3(–5), compressed ellipsoidal, 1–2 cm long.

Garcina mangostana is native to Indonesia or Malaysia but is widely cultivated in moist tropical countries for its pleasing edible fruits. In Panama collections are known only from cultivated trees on Barro Colorado Island, but other trees may persist from cultivation elsewhere in the country.

CANAL ZONE: Barro Colorado Island, *Croat 4561* (DUKE, SCZ); *D'Arcy & Foster 13308* (MO). Summit Gardens, *Folsom 3801* (MO).

2. **Garcinia pictorius** (Roxb.) D'Arcy, comb. nov.—FIG. 4A.

Xanthochymus pictorius Roxb., Pl. Cormorandel 2: 51, 5: *t. 196*. 1805. TYPE: India, *Roxburgh* (BR, fide Maheshwari, not seen).
X. tinctorius DC., Prodr. 1: 562. 1824. *X. pictorius* Roxb. orth. mut.
Garcinia xanthochymus (Roxb.) Hook. f. ex T. Anders. in Hook. f., Fl. Brit. India 6: 269. 1874.

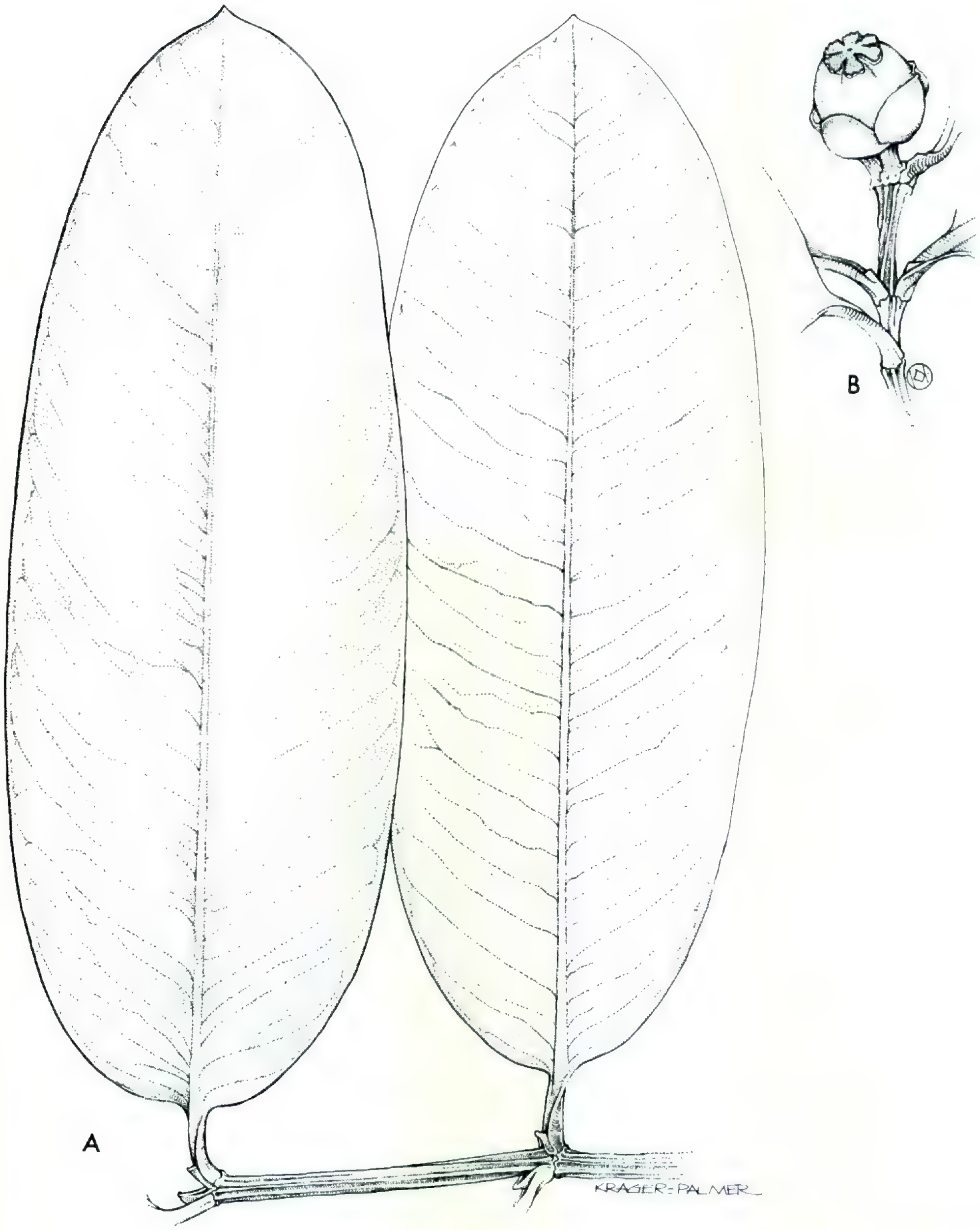

FIGURE 4. *Garcinia*.—A. *G. pictorius* (Roxb.) D'Arcy. Stem with leaves (×½). [After *Tyson 6691* (MO).]—B. *G. mangostana* L. Fruit (×½). [After *D'Arcy & Foster 13308* (MO).]

Transfer of *Xanthochymus* Roxb. from genus to species level. Nom. illeg., cites *Xanthochymus pictorius* Roxb., *X. tinctorius* DC.

G. tinctoria (DC.) Dunn in Gamble, Fl. Pres. Madras 74. 1915.

Medium size or large *tree*; trunk straight, the branches drooping, angular; sap yellow. *Leaves* oblong, to narrowly obovate, apically acute or short acuminate, basally rounded, sometimes somewhat dimidiate, the costa broad, plane or im-

pressed above, elevated beneath, coriaceous, shiny, often drying yellowish; petiole sharply angled with a basal enclosed pit, often drying yellow, the lateral veins arcuate, loop connected to form a submarginal vein 2–3 mm from the margin. *Inflorescences* several-flowered axillary fascicles; pedicels ca. 2.5 cm long. *Flowers* (from Maheshwari) white, ca. 1.5 cm across; sepals (4–)5, orbicular, concave, fleshy, unequal, apically ciliate; petals 5, ca. 8 mm long, orbicular, spreading, incurved, greenish; stamens in 5 broad bundles of 3–5 each, antipetalous, alternating with 5 fleshy glands, the anthers bilocular, pistillate flowers with staminodes few, complanate; ovary ovoid, acuminate, 5 locular, stigmas 5. *Fruit* baccate, ca. 6.5 cm across, subglobose, pointed, dark yellow with copious yellow gum when cut; seeds 1–4, imbedded in a yellow, aril like pulp.

All collections of this species from Panama are from cultivated trees. On these specimens the fruit has dried conspicuously wrinkled, but it is reportedly smooth in vivo.

Garcinia pictorius is a native of eastern India and Burma, and it is cultivated as an ornamental tree. The fruits can be used for making sherbets, preserves and jams. The gummy resins of the fruit have been used to make water colors. In India, the rootstocks are sometimes used for grafting on mangosteen (*G. mangostana*).

CANAL ZONE: Without other locality, *Johansen 1924* (US). Summit Gardens, 0–100 m, *Mori & Kallunki 1873* (MO). Balboa, *Standley 30905* (US). Fort Clayton Officers Club, *Tyson 6691* (MO). PANAMÁ: Between Las Sabanas and Matías Hernández, *Standley 31800* (US).

6. HAVETIOPSIS

Havetiopsis Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 246. 1860. LECTOTYPE: *H. martii* Pl. & Tr.

Dioecious, epiphytic or free standing *shrubs* and *trees*. *Leaves* obovate, coriaceous, short petiolate. *Inflorescences* short, mostly branching cymes, each divarication subtended by a pair of minute cucullate bracts. *Flowers* small, sepals 4, decussate; petals 4, decussate, thick, rotund; stamens 4, opposite the petals, the filaments basally thickened, narrowed under the anther, connate or free, the anthers ovate, 2-loculed, in pistillate flowers the anthers reduced or obsolete; styles 4, short. *Fruit* a capsule dehiscing into 4 valves; seeds few or many, arillate.

This genus includes 3–4 species of Panama and tropical South America, which occur in lowlands or at middle elevations. It is not clear from the material at hand or from the literature that this genus is distinct from *Havetia* H.B.K. Vesque (1893) argued that the separation of the two genera by Planchon and Triana was based on a misinterpretation of the material and united the two. Engler (1925) however, maintained the two genera as distinct, but the distinctions he saw may not be valid. Should the two genera be united, then the species included here, *Havetiopsis flexilis*, would be known as *Havetia flexilis* (Pl. & Tr.) Vesque.

1. **Havetiopsis flexilis** Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 246. 1860. TYPE: Brazil, *Spruce 3294* (P, not seen).—FIG. 5.

Havetia flexilis (Pl. & Tr.) Vesque in DC., Monog. Phan. 8: 155. 1893; Epharm. 3, *t. 72, 73*. 1892.

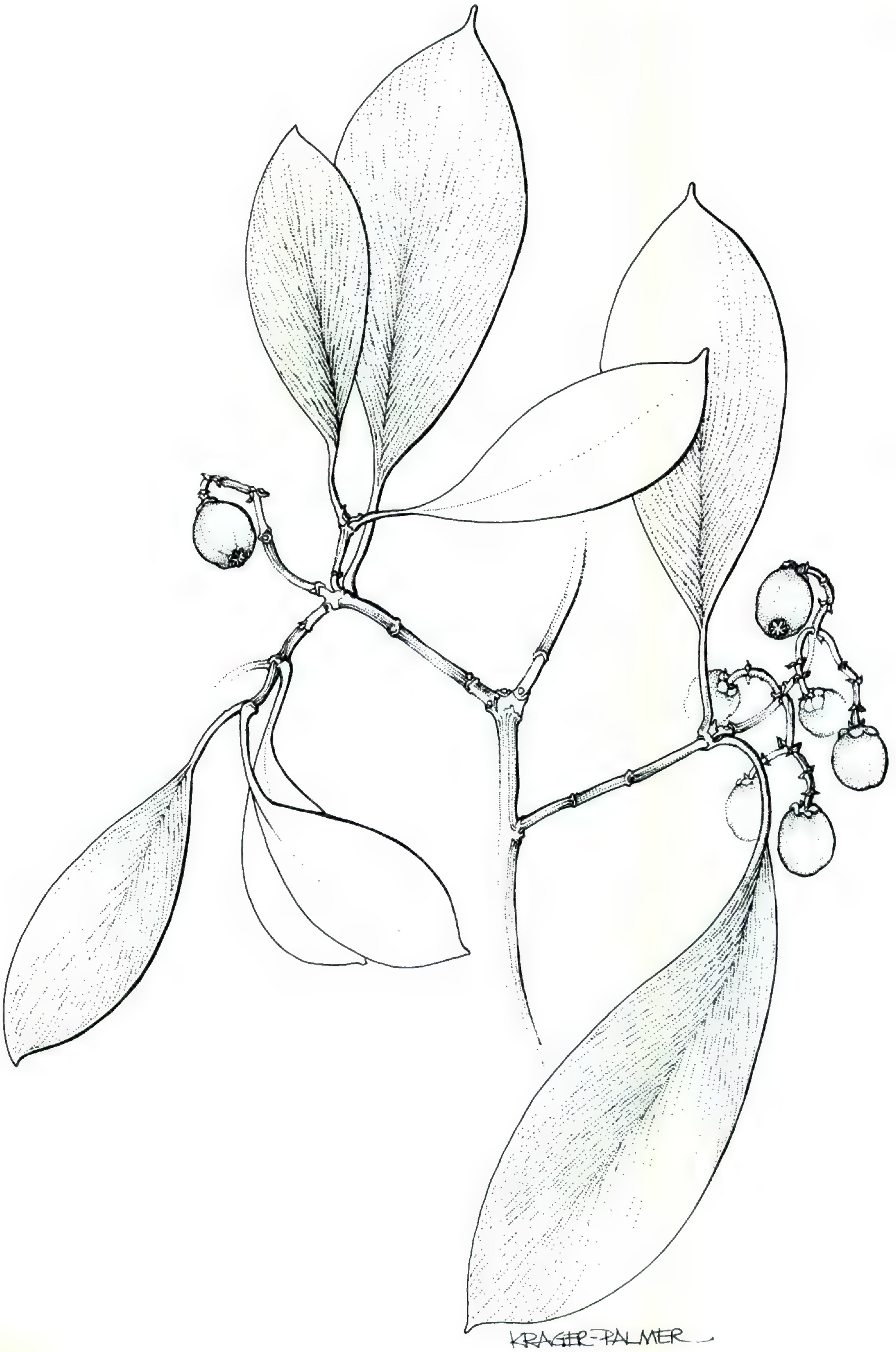

FIGURE 5. *Havetiopsis flexilis* Pl. & Tr. Fruiting branch (×3/5). [After *Folsom 3945* (MO).]

Dioecious epiphytic *shrubs* or small *trees* to 4 m tall; surface of youngest twigs sometimes wrinkling somewhat on drying (see *Clusia minor* above). *Leaves* obovate, mostly 6–10 cm long, 3–5 cm wide, apically rounded or emarginate, basally cuneate, the lateral nerves numerous, conspicuous or not, straight, arcuate or slightly recurving proximally, arcuate distally forming an even submarginal vein, minor venation mostly obscure, coriaceous, the margins drying slightly revolute; petioles ca. 5 mm long. *Inflorescences* short, mostly 1–3 cm long, several-flowered dichasial panicles, internodes angled, bracts scale like, cucullate, paired, thick, to 2 mm long or rudimentary; pedicels obsolete. *Flower* buds globose, sepals 4, decussate, rotund, cucullate, the margins scarious, ca. 5 mm long, the outer pair shorter, basally united; petals 4, rotund, ca. 5 mm long, greenish marked with purplish; stamens 4, ca. 2 mm long, the filaments basally thickened, about as long as the anthers, the anthers introrse; in pistillate flowers the anthers reduced in size, the filaments connivent into a tetragonal column; styles 4. *Fruit* a fleshy capsule with 4 rounded angles, depressed globose or subcylindrical, to 1.5 cm long, styles persistent, erect, short, dehiscing into 4 valves, seeds numerous, orange, ca. 3.5 mm long, immersed in a red-orange matrix.

Because of the paucity of material at hand, many details for the above description were taken from Vesque (1893) and Croat (1978).

This species ranges from Panama to Brazil, occurring in tropical wet and moist forests of low elevations.

CANAL ZONE: Barro Colorado Island, *Croat 6621, 8259, 12505, 14844* (all MO), *16195* (MO, SCZ); *Foster 1100* (DUKE), *1767* (DUKE, MO, PMA, SCZ). CHIRIQUÍ: Haras San Miguel just N of Concepción near Río Mula, *Folsom 3945* (MO). COLÓN: Al este de la zona montañosa de Santa Rita, *Correa & Dressler 764* (MO).

7. MAMMEA

Mammea L., Sp. Pl. 512. 1753; Gen. Pl. ed. 5. 228. 1754. TYPE: *M. americana* L.

Potamocharis Rottb., Act. Lit. Univ. Hafn. 1: 296. 1778. TYPE: *P. mamei* Rottb.
?Ochrocarpus Thouars, Gen. Nov. Madag. 15. 1806. TYPE: *O. madagascariensis* DC.
?Calysaccion Wight, Illustr. 1: 130. 1840. TYPE: *C. longifolium* Wight.

Polygamous glabrous, *tree*; foliage dark green; sap yellow. *Leaves* opposite, entire, elliptical, coriaceous, the costa prominent, lateral veins numerous in two series, anastomosing only near the margin or forming a reticulum over most of the surface, submarginal vein not defined, minor venation forming a reticulum, evanescent towards the costa, the areoles punctate. *Inflorescences* of solitary flowers fascicles in the axils of mature leaves or mature wood; pedicels stout. *Flower* buds globose; sepals 2(–3), coriaceous; petals 4–6, white or pink; stamens numerous, crowded, basally united in several whorls, the anthers longitudinally dehiscent; ovary 2–4-locular, the style short, the stigma peltate 2–4-lobed; ovules 1–2 per locule, erect. *Fruit* a leathery berry, sometimes large, the exocarp, coriaceous, the mesocarp orange or yellow, fleshy, sometimes copious; seeds large, oblong or slightly arcuate.

Mammea includes one species widespread in the Caribbean area, a new species in Panama, and depending on circumscription, several species in Africa,

Madagascar and the Indomalay area. The two species treated here may be recognized by their large warty fruits with orange pulp, and by the coriaceous leaves with lateral veins branching near the margin into a reticulum and with punctate areoles. The trees are of minor economic importance. The wood is used for general construction, and the heartwood is reported to have insecticidal properties. The orange pith of the fruits of both species is edible. The seeds are toxic.

The two species of *Mammea* recorded here have the largest fruits of any Guttiferae in Panama. Alexandre (1978) reported that similar fruits of *M. africana* are dispersed by elephants. The dispersal agent of the New World plants is unknown.

The African element of *Mammea, M. africana* Oliver, has usually been recognized in *Mammea,* but Vesque (1893) placed it in *Ochrocarpus* which is typified by a plant from Madagascar where there are other species. Vesque based his placement on structure of the embryos, but he noted that in other respects many of these plants appear to be congeneric. The second species described here, *M. immansueta,* might fall into *Ochrocarpus* when data are available to apply Vesque's criteria. Engler (1925) maintained the African species as *Mammea.*

For controversy about separating *Rheedia* from *Mammea* see Grisebach (1861) and Planchon and Triana (1861). Here the justification for separation of the genera is based on the cotyledons and perianth. *Rheedia lateriflora* is superficially much like a species of *Mammea.*

Literature:

Alexandre, Y. D. 1978. Le rôle disseminateur des éléphants en forêt de Tai, Côte-D'Ivoire. Terre & Vie 32: 47–72.

Pittier, H. 1912. New or noteworthy plants from Colombia and Central America 3. Contr. U.S. Natl. Herb. 13: 431–466.

a. Leaves pointed; leaves mostly more than 7 cm wide; petioles drying yellowish green; fruit seldom more than 7 cm across ---------- 2. *M. immansueta*

aa. Leaves rounded; leaves mostly less than 7 cm wide; petioles drying reddish brown; fruits reaching 15 cm across ---------- 1. *M. americana*

1. **Mammea americana** L., Sp. Pl. 512. 1753. TYPE: Antilles, herb. Linn. (LINN 675.1, not seen; MO, microfiche).

Polygamous *tree* to 20 m tall, often narrow and densely leafy; sap yellow; twigs stout. *Leaves* broadly obovate or elliptical, apically rounded or slightly emarginate, basally rounded or obtuse, the margin minutely indurate, the costa subplane above, proximally canaliculate, conspicuously elevated and drying minutely sulcate beneath; lateral nerves parallel, slightly ascending numerous in 2 similar series, 6–7 per cm (both series), anastomosing at the margin but not forming a submarginal vein, cross veins numerous, forming a rectangular reticulum, the areoles 1–2-punctate beneath, ca. 20 cm long, 10 cm wide; slightly discolorous, petiole stout, ca. 1 cm long, canaliculate above, the bases generally not connate or forming a petiolar ridge. *Inflorescences* 1–several flowers on twigs behind the leaves; pedicels stout, ca. 10 mm long. *Flowers* fragrant, the sepals 2, rotund, 10–15 mm long, cucullate, sometimes keeled coriaceous; petals ca. 6

white, spreading, rotund, shorter or longer than the sepals, stamens numerous, the filaments glabrous, slender, basally expanded and united into several whorls, the anthers of 2 longitudinal thecae separated by the undifferentiated connective; ovary pyriform, the style short, the stigma peltate, repand, centrally depressed. *Fruit* a large leathery globose berry to ca. 15 cm across, with thick brownish warty rind and thick fleshy orange or yellow pulp (mesocarp); locules 2–4, filled with the large, oblong slightly arcuate seeds 2.5–4 cm long which are covered with reddish brown fibrous material.

This species is sparingly cultivated in Panama, and Pittier (1912) reports having seen it wild in Veraguas. It is common in slightly drier regions of western Central America and in the Antilles, where it is sometimes cultivated as a specimen tree or for its fruit.

CANAL ZONE: Cultivated, Barro Colorado Island, *Croat 5787* (SCZ). PANAMÁ: Taboga Island, *Standley 27054* (US).

2. **Mammea immansueta** D'Arcy.[8] TYPE: Panama, *Mori et al. 4699* (MO, holotype).—FIG. 6.

Tree 30 m tall, twigs drying yellowish. *Leaves* clustered near the ends of twigs, elliptical, apically short-acuminate, basally obtuse, the margins sharp, sometimes slightly revolute, ca. 15 cm long, 7–8 cm wide, the costa mostly immersed above, broad and sulcate proximally, prominently elevated and somewhat sulcate beneath, the lateral veins numerous, parallel, equally spaced, in two series, the primary series ca. 3 per cm, mostly unbranched in the first half, anastomosing and forming a reticulum in the region near the margin not forming a distal submarginal vein, obscure but slightly elevated and reticulated above, beneath more conspicuous, the lateral veins and those near the margin slightly elevated, the minor reticulum plane, evanescent towards the costa, the areoles punctate, petiole 10–15 mm long, thick, drying yellowish, deeply canaliculate above. *Inflorescence* and *flowers* not seen, the fruits borne in pairs 7–8 cm apart along the branch (8–10 mm diam.). *Fruits* globose with a small apiculum, 4–7 mm across, warty, the pedicel becoming 7–10 mm long, 6–8 mm thick; the rind thick, the pulp scant (?) orange, 4-locular; seeds one in each locule, ca. 5 cm long, arcuate.

This species is distinct from *M. americana* in its smaller fruits which have scant pulp and in its smaller, much narrower pointed leaves. It is closely related to *M. africana* Oliver, from which it may not be distinct. However, the leaves of *M. immansueta* are much wider than those of collections seen from the south-

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[8] *Mammea immansueta* D'Arcy, spec. nov. *Arbor. Folia* elliptica, brevi-acuminata, coriacea, ca. 15 cm longa, 7–8 cm lata, costa subtus prominenti, nervis lateralibus seriebus duobus, primariis circa 3 per cm, prope marginem anastomosantibus, vena submarginali haud formantibus, supra grisea siccans, venis minoribus leviter elevatis, reticulatis, obscuris, subtus viridis siccans, venis minoribus prominentibus, areolis punctatis, vix reticulatis parte prope marginem excepto; petiolo crasso, supra profunde canaliculato. *Fructus* globosus, brevi-apiculatus, verrucosus, 4–6 cm diametro; seminibus quattuor, grandis, oblongis, uno in quoque loculo.

ern Congo and much more coriaceous than those from the western Congo and Guinea regions. If it is in fact the same as the African species, the time and means of introduction into the New World are enigmatic. The collectors report it is a frequent element in the El Llano-Cartí transect across the isthmus.

PANAMÁ: El Llano-Cartí road, *Mori et al. 4699* (MO).

8. MARILA

Will McDearman[9] and Sidney McDaniel[9]

Marila Swartz, Prodr. Veg. Ind. Occ. 84. 1788. TYPE: *M. racemosa* Swartz.

Shrubs or *trees*, the twigs laterally compressed, the plane of compression often decussate from successive nodes, with white, brown, yellow, or clear latex. *Leaves* evergreen, opposite, simple, entire, glabrous or variously pubescent, coriaceous or nearly so, nerves impressed above, raised beneath, with more or less parallel secondary veins connecting the lateral, petiolate, estipulate. *Inflorescences* racemose or paniculate, axillary at mostly defoliated nodes or rarely terminal; pedicels subtended by 3 minute bracts. *Flowers* bisexual or unisexual, 4–5-merous; sepals in two series, usually differing in shape, texture and vestiture, persistent in fruit; petals membranous, fugaceous; stamens numerous, the filaments free, anthers linear, longitudinally dehiscent with a tubular, rotate or filiform appendage at the end of the connective; ovary 3–5-celled, ovules numerous in each locule, attached to an axile placenta, the style simple, the stigma conical or nearly so. *Fruit* a septicidal capsule, in dehiscence the valves often twisting and revealing the papyraceous column; seeds minute, elliptic-oblong, comose at both ends.

Marila is a distinctive genus of about 20 species of the neotropics, mostly of moderate to high rainfall areas, from Guatemala and the Antilles to Bolivia. It is questionable that the genus actually belongs in the Guttiferae, and it would probably be better placed in the Bonnetiaceae. The genus is in need of a revision, though the species appear to be well marked. Many specimens of various species from Panama have been determined as *Marila macrophylla* Benth., which is not known to occur there. This species may be distinguished by the thicker pedicels (to 4 mm wide at base) and larger flowers.

a. Leaves with 25–38 pairs of primary veins; anther appendage tubular to rotate.
  b. Rachis of inflorescence with numerous, stalked, stellate trichomes, the surface reddish-brown; pedicels 4–7 mm long ---------- 2. *M. lactogena*
  bb. Rachis of inflorescence with mostly sessile, rarely stalked, stellate trichomes, the surface yellow-brown; pedicels 11–12 mm long ---------- 4. *M. pluricostata*

aa. Leaves with 6–17 pairs of primary veins; anther appendage filiform.
  c. Lower surface of leaves with conspicuous punctate glands; pedicels 1–2 mm thick at base; capsules 4–7 cm long ---------- 3. *M. laxiflora*
  cc. Lower surface of leaves without punctate glands; pedicels 0.5–1 mm thick at base; capsules 1.2–2.5 cm long ---------- 1. *M. domingensis*

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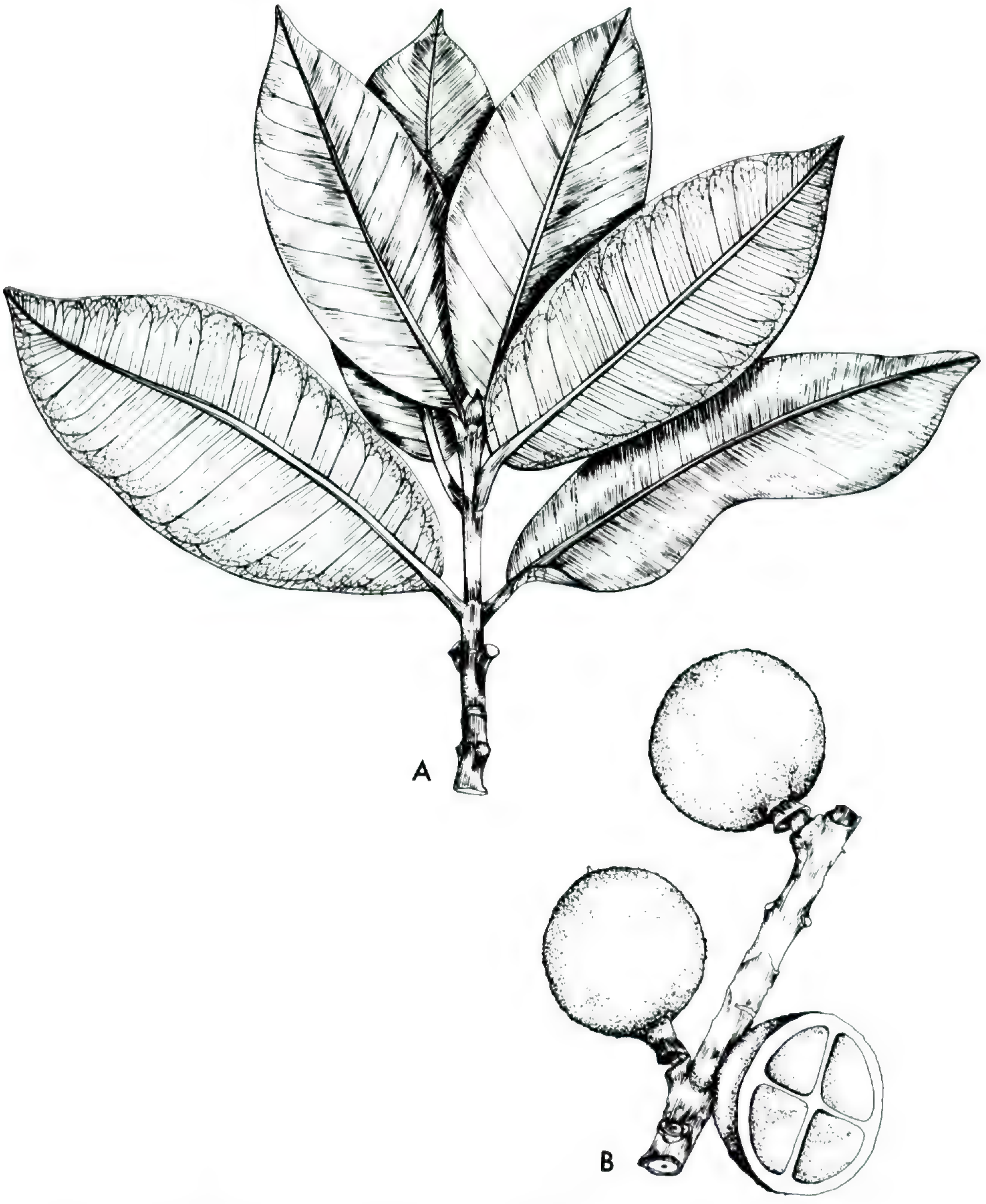

FIGURE 6. *Mammea immansueta* D'Arcy.—A. Habit (×½).—B. Fruit (×½). [After *Mori et al. 4699* (MO).]

1. **Marila domingensis** Urban, Ark. Bot. 22A(10): 17. 1929. TYPE: Haiti. Massif de la Hotte, ridge of Morne Delcour, *Ekman H9001* (S, holotype, not seen; F, isotype).

Small or medium sized *tree* to 7 m, younger branches puberulent or villous, becoming glabrate. *Leaves* 5–21 cm long, 2.5–6.8 cm wide, apically attenuate, acute or subabruptly acuminate, the acumen to 1 cm long, basally obtuse or rounded, glabrous, primary veins in 6–17 pairs, 0.6–1.5 cm apart, arcuately anas-

tomosing near the margin; petioles 0.7–2 cm long, longitudinally striate, villous. *Inflorescence* racemose, axillary at foliated or defoliated nodes, glabrous or puberulent to tomentose, 1–3 flowers per cm, rachis 4.5–8.5 cm long, the slender pedicels 0.6–2 cm long, 0.5–1 mm thick at base. *Flowers* white; sepals 6–7 mm long, ovate, minutely puberulent on the margins or glabrous, reflexed at anthesis, erect in fruit; petals 7–8 mm long, obovate; stamens numerous, anthers ca. 1.3 mm long, appendage filiform, the filaments to 2.5 mm long; ovary ca. 3.5 mm long, style 1.5–2 mm long. *Fruit* an obconical, often fusiform, brown capsule 1.2–2.5 cm long; seeds 0.5–0.8 mm long.

Marila domingensis is a very distinctive species, easily recognized by the short fruits and very slender pedicels. It has not until now been reported from Panama and was previously known only from Haiti. Specimens suggest that in Panama this species flowers in December and January and fruits in March and April.

PANAMÁ: Carti Road, ca. 16 km, *Kennedy 3076* (MO). El Llano-Cartí-Tupile Road, 12 mi above Panamerican Highway, 200–500 m, *Liesner 1228* (MO). El Llano-Cartí Road, 10.8 km from Interamerican Highway, 1100–1200 ft, *Mori & Kallunki 4115* (MO). El Llano-Cartí Road, 22.6 km from Interamerican Highway, 350 m, *Mori & Kallunki 5099* (MO). SAN BLAS: El Llano-Cartí Road, 24.5–25 km from Interamerican Highway near continental divide, *Mori & Kallunki 5520* (MO).

2. **Marila lactogena** Cuatr., An. Inst. Biol. Univ. Nac. México 20: 92. 1950. TYPE: Colombia: Depto. Valle, Río Naya, Puerto Merizalde, *Cuatrecasas 14040* (F, holotype; US, isotype).

Tree to 13 m, younger branches ferrugineous-tomentose, glabrescent; twigs with sticky white latex. *Leaves* 14.5–40 cm long, 5–14 cm wide, oblong-elliptic to oblong-lanceolate, apically more or less abruptly acuminate, the acumen to 1 cm long, basally rounded or obtuse, sparsely puberulent above except tomentose near the midvein, beneath reddish-brown with stalked stellate trichomes and minute appressed scales, primary veins 35–38 pairs, 0.5–1.1 cm apart, united into a marginal vein, petioles 2.2–3.5 cm long, ferrugineous-tomentose, grooved above. *Inflorescence* racemose, axillary from older defoliated nodes or terminal on young branchlets, ferrugineous-tomentose with abundant, minute stalked stellate trichomes, 2–8 flowers per cm, rachis 15–30 cm long, pedicels 4–7 mm long. *Flowers* of unknown color; sepals 6–8 mm long, reflexed at anthesis, erect in fruit, mostly oblong-ovate or elliptic, rarely lanceolate, tomentose; petals not seen; stamens numerous, the anthers 0.6–1.2 mm long, the appendage tubular to somewhat rotate, minutely pitted and glandular; ovary ca. 4 mm long, style 1 mm or less long at anthesis, elongating in fruit. *Fruit* a linear fusiform black capsule 1.1–2 cm long; seeds ca. 1 mm long.

This species occurs in Panama and Colombia.

This species has not previously been reported from Panama, but the material cited above agrees in all essentials with the type from Colombia. *Marila lactogena* in Panama would appear to be restricted to wet forest.

PANAMÁ: El Llano-Cartí Road, 7–12 km from Panamerican Highway, 360–400 m, *Croat 25113* (MO). 11 km from Escuela Agricola Alto de Piedra, in forest along Río Dos Bocas, *Mori & Kallunki 3124* (MO). SAN BLAS: Forest SE of Puerto Obaldía, *Croat 16813* (MO).

3. **Marila laxiflora** Rusby, Mem. Torrey Bot. Club 6: 9. 1896. TYPE: Bolivia. Between Tipuani and Guanai, *Rusby 1648* (NY, holotype, not seen; MO, isotype).

M. verapazensis Donn. Sm. Bot. Gaz. 47: 253. 1909. TYPE: Guatemala. Alta Verapaz. Cubilquitz, *Tuerckheim 1074* (US).

Shrub or *tree* to 20 m, younger branches densely appressed glandular-pubescent, glabrescent, the twigs with brown or yellow-brown latex. *Leaves* 9–28 cm long, 2–12 cm wide, ovate, oblong, elliptic or elliptic-lanceolate, apically abruptly acuminate, the acumen to 1.5 cm long, basally rounded or acute, densely brown velutinous before unfolding, becoming glabrous, glabrate or sparsely pubescent along the veins beneath, primary veins 10–15 pairs, mostly 1–2 cm apart, arcuately anastomosing into a marginal vein; petioles 1–2 cm long, finely pubescent, grooved above. *Inflorescence* racemose, axillary from mostly older defoliated nodes, puberulent, 1–4 flowers per cm, rachis 12–30 cm long, pedicels 5–8 cm long, 1–2 cm thick at base. *Flowers* green, fragrant; sepals 6–8 mm long, ovate or elliptic, puberulent, reflexed at anthesis, but erect in fruit; petals 6–9 mm long, oblanceolate to oblanceolate-oblong; stamens numerous, the anthers ca. 1.5 mm long, the appendage filiform; ovary ca. 3 mm long, the style ca. 3 mm long. *Fruit* a linear, yellow-brown capsule 4–7 cm long; seeds ca. 1 mm long.

Guatemala to Bolivia.

There appear to be no essential differences between plants from throughout the range, those from northern Central America being indistinguishable from those of Bolivia. This species has the greatest distribution of any in the genus both in the neotropics and in Panama. It is a tree of wet forest of low to moderate elevations.

CANAL ZONE: River bank between Fort Sherman and Fort San Lorenzo, *Croat 15437* (F, MO). Chagres, March 2, 1850, *Fendler* (MO, US). Barro Colorado Island, *Foster s.n.* (MO). Pipeline Road, *Lao et al. 17* (F, MO, SCZ). COCLÉ: Bismark above Penonomé, *Williams 568* (US). COLÓN: Achiote, *Tyson et al. 4517* (DUKE, MO, SCZ). DARIÉN: Río Pirre, *Bristan 1467* (MO, US). Piñas, *Duke 10641* (AMES, MO, OS). Puerto St. Dorothea, *Dwyer 2225* (MO). Slopes of Cerro Pirre, 1300 m, *Mori 370* (MO). Caná, 2500 ft, *Stern et al. 525* (MO, US). Periaque camp at river, *Tyson et al. 4742* (MO, SCZ). PANAMÁ: Cerro Campana, *Croat 14234* (MO). Cerro Jefe, 700 m, *Dressler 3681* (DUKE, F, MO); 3100 ft, *Dwyer & Gentry 9497* (MO). San José Island, *Erlanson 52* (US); *Johnston 685* (MO, US), *808* (US). Cerro Campana, 2000 ft, *Tyson 6435* (F, MO).

4. **Marila pluricostata** Standley & L. Williams, Ceiba 3: 52. 1952. TYPE: Costa Rica, *Skutch 5420* (US, not seen; F, photo).—FIG. 7.

Tree to 15 m, younger branches densely brown tomentose with numerous minute appressed lepidote scales, glabrescent, twigs with pale yellow latex. *Leaves* 11.5–26 cm long, to 40 cm long on sterile shoots, 3.5–9 cm wide, oblong-lanceolate, elliptic or lanceolate, acuminate, the acumen to 1.1 cm long, basally obtuse or somewhat rounded, glabrous above, beneath glabrate or more commonly with minute sessile stellate hairs and appressed lepidote scales, the major veins with an occasional stalked stellate trichome, primary veins 25–32 pairs, 0.4–1 cm apart, united into a marginal vein; petioles 1–3.7 cm long, grooved above. *Inflorescence* racemose, axillary at foliated or older defoliated nodes, rarely terminal on younger branches, densely brown tomentose with abundant

FIGURE 7. *Marila pluricostata* Standl. & Williams—A. Fruiting branch (×½). [After *Mori & Kallunki 5077* (MO).]—B. Flowers (×½). [After *Mori & Kallunki 5129* (MO).]

minute sessile stellate trichomes and a few lepidote scales, ca. 4 flowers per cm; rachis 10–18 cm long, pedicels 11–12 mm long, elongating to 15 mm in fruit, ca. 2 mm thick at base. *Flowers* pink to bright magenta; sepals 9–12 mm long, ovate to ovate-lanceolate, externally densely brown tomentose with minute appressed sessile stellate trichomes and scales, internally glabrate, reflexed at anthesis and in fruit; petals 11–12 mm long, obovate; stamens numerous, the anthers ca. 1.5 mm long, the appendage tubular; ovary 5–6 mm long, the style ca. 2.5 mm long. *Fruit* a fusiform, frequently bent capsule 1.5–2.5 cm long; seeds ca. 1 mm long.

This species occurs in Costa Rica and Panama.

This species, like others of the genus in Panama, is confined to wet forest at relatively low elevations. A photo of the type of *Marila cespedeziana* Tr. & Pl. was examined. The inflorescence appears to be similar to that of this species, but the separate vegetative portion is not this species. It may not even be this genus but *Vismia*. Therefore the two species are not placed in synonymy.

COLÓN: Santa Rita lumber road, *Correa & Dressler 596* (DUKE, MO, SCZ). East Ridge, *Duke 15259* (MO). Santa Rita Ridge Road, 9 km from Boyd-Roosevelt Highway, 350 m, *Mori & Kallunki 5077* (MO). PANAMÁ: Between Cerro Azul and Cerro Jefe, *Dressler 3271* (DUKE, MO, SCZ). El Llano-Cartí Road, 18 km from Interamerican Highway, 350 m, *Mori & Kallunki 4580, 5129* (both MO).

9. RHEEDIA

Rheedia L., Sp. Pl. 1193. 1753; Gen. Pl. ed. 5. 449. 1754. TYPE: *R. lateriflora* L.

Verticillaria Ruiz & Pavon, Prod. Fl. Peruv. Chile 81, *t. 15*. 1794. TYPE: *V. acuminata* R. & P. ≡ *Rheedia acuminata* (R. & P.) Pl. & Tr.

Chloromyron Pers., Syn. 2: 73. 1807. TYPE: *C. verticillatum* Pers., superfluous name for *Verticillaria acuminata* R. & P. ≡ *Rheedia acuminata* (R. & P.) Pl. & Tr.

?*Lamprophyllum* Miers, Trans. Linn. Soc. London 21: 249. 1854; Proc. Linn. Soc. London 2:883. 1854 [1855]. TYPE: *L. laetum* Miers. Sp. dubium.

Tsimatimia Jum. & Perrier, Ann. Sci. Nat. Bot. Sér. 9. 11: 256. 1910. TYPE: *T. pervillei* (Pl. & Tr.) Jum. & Perrier ≡ *Rheedia pervillei* Pl. & Tr.

Polygamodioecious *trees*; sap yellowish or white; twigs often angular. *Leaves* opposite (verticillate), entire, the costa prominent, the lateral nerves numerous, parallel, irregular, sometimes in 2 series, the minor venation reticulate, a submarginal vein usually present, at least distally, coriaceous, petioles with a basal wedge of tissue forming an axillary pit. *Inflorescences* of fasciculate or solitary flowers at the leaf axils, sometimes inserted into a bracteate annulus; pedicels often elongate and slender. *Flowers* small, the buds globose, sepals 2, imbricate, but somewhat united basally; petals 4, decussate and imbricate, the pairs often of slightly different size, the outer pair alternating with the sepals; the stamens numerous in staminate flowers, free, inserted beneath (abaxial to) or upon a fleshy, hemispherical or lobate disc, in perfect flowers the stamens fewer, the anthers subglobose, dorsifixed, longitudinally dehiscent; ovary wanting in staminate flowers, in hermaphrodite flowers 3–4-loculed, partly surrounded by the disc, the ovules 1 per locule, the style forming a stipe or not, the stigmas peltate, discoid or hemispheric, entire or lobed. *Fruit* baccate, the pericarp leathery, smooth or tuberculate, 1-celled; seeds 1–4, faboid in shape, enveloped in a pulpy aril.

Rheedia is a genus of forest trees with perhaps two dozen species ranging through tropical America and Madagascar and is probably congeneric with a number of species in Africa now placed in *Garcinia*. Recently Robson (1958) and Adams (1970) united *Rheedia* with *Garcinia* noting that the affinities of *Rheedia* are with the African species of *Garcinia* sect. *Teracentrum* Pierre and sect. *Rheediopsis*. These two sections form subg. *Rheediopsis* Vesque, which is distinct from other species of *Garcinia* in a number of respects including leaf anatomy and which has been remarked on by Vesque (1892a, 1892b, 1893) and Engler

(1925) as being closely related to *Rheedia*. Rather than uniting *Rheedia* with *Garcinia* as was advocated by Robson and Adams, it is probably more correct to separate subg. *Rheediopsis* from *Garcinia* and unite it with *Rheedia*. The other two subgenera of *Garcinia*, subg. *Garcinia* and subg. *Xanthochymus*, typified by *G. mangostana* and *G. pictorius* respectively, both represented in this flora, are different from *Rheedia* in leaf architecture, histology and general appearance and in complexity of the flowers.

Lamprophyllum Miers is maintained here under *Rheedia* following Vesque (1893) and not under *Calophyllum* L., where it is listed in the Index Nominum Genericorum. In his first discussion of the genus, Miers considered *Lamprophyllum* in apposition to *Calophyllum*, to *C. calaba* L. specifically, and the fruit he described, which is the basis for the species *L. laetum*, is like *Rheedia* in having a "thick mucilaginous pulpy arillus" and not at all like *Calophyllum* which has no distinguishable aril. In his second discussion of the genus, Miers included *Calophyllum*, but he considered *C. calaba* to be distinct from *Lamprophyllum laetum*. Vesque may have seen material annotated by Miers.

Literature:

Adams, C. D. 1970. Miscellaneous additions and revisions to the flowering plants of Jamaica. Phytologia 20: 309–314.

Robson, N. 1958. *Guttiferae*. *In* New and little known species from the Flora Zambesiaca area. Bull. Soc. Brot. 32: 170–173.

Vesque, J. 1892a. Histoire des *Garcinia* du sous-genre *Xanthochymus*. Compt. Rend. Hebd. Séances Acad. Sci. 114: 562–564.

———. 1892b. Histoire des *Garcinia* du sous-genre *Rheediopsis*. Compt. Rend. Hebd. Séances Acad. Sci. 114: 844–846.

a. Fruits tuberculate; leaves drying with the submarginal vein at the margin but distinguishable from it with the naked eye, the margin thus appearing sharp, lateral veins 5–6 per cm, ca. 12 including intermediate veins ---------- 1. *R. acuminata*

aa. Fruits smooth; leaves with the submarginal vein either indistinguishable from the margin when viewed from above or more than 2 mm from it, the margin thus appearing blunt or revolute, lateral veins fewer than 4 per cm, fewer than 7 per cm including intermediate veins.

b. Fruit mostly less than 3 cm long; leaves mostly much more than twice as long as wide ---------- 2. *R. edulis*

bb. Fruit mostly more than 3 cm long; leaves mostly about twice as long as wide.

c. Stems drying saliently angled (Fig. 8C); leaves drying brown, concolorous but usually shiny above, not lineolate beneath ---------- 4. *R. macrophylla*

cc. Stems drying moderately sulcate or terete (Fig. 8B); leaves drying discolorous, mostly dull above, lineolate beneath ---------- 3. *R. lateriflora*

1. **Rheedia acuminata** (R. & P.) Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 314. 1860.

Verticillaria acuminata R. & P., Syst. Fl. Peruv. 140. 1798. TYPE: Peru, *Ruiz* (B, if extant, not seen; MO, photo). Not *Garcinia acuminata* Pl. & Tr. (1860).

Chloromyron verticillatum Pers., Syn. 2: 73. 1807. Based on *Verticillaria acuminata* R. & P.

Calophyllum madruno H.B.K., Nov. Gen. & Sp. 5: 202. 1822. TYPE: Colombia, *Bonpland* (P, not seen; MO, photo).

?*Garcinia floribunda* Miq., Stirp. Surinam. Select. 89. 1850. TYPE: Surinam, *Kappler 593*, not seen.

?*Rheedia floribunda* (Miq.) Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 319. 1860.

R. rostrata Miers ex Vesque, Epharm. 2: *t. 72*. 1889; in A. DC., Monog. Phan. 8: 510. 1893.
R. acuminata var. *floribunda* (Miq.) Vesque in A. DC., Monog. Phan. 8: 510. 1893.

Tree to 10 m tall; sap yellow; glabrous except the fruit; twigs slender, drying green-sulcate. *Leaves* elliptical or obovate, often drying bluish-green, 10–20 cm long, 4–6 cm wide, acute at each end, sometimes slightly umbonate and falcate apically, the margin appearing sharp, the costa elevated on both sides, sharp beneath, the lateral veins numerous, 5–6 per cm, ca. 12 per cm including intermediate veins, the lateral veins parallel to near the margin then becoming reticulate, elevated on both sides, mostly conspicuous, the submarginal vein ca. 0.5 mm from the margin, evident on drying; petiole 10–15 mm long. *Inflorescences* fasciculate in the leaf axils; pedicels slender, 15–20 mm long. *Flowers* polygamous, ca. 6 mm across; sepals 2, ca. 3 mm long; petals 4, white, rotund, cucullate, 5–7 mm long, reflexed; stamens numerous, the filaments free, inserted in several whorls, the anthers yellow, minute, globose to cordate, the thecas opening transversely to form an apical slit; ovary inserted in an annular, 1.5–2 mm-thick disc, umbonate, the stigmas forming a hemispherical cap on the style (ovary-umbo). *Fruit* ellipsoidal, mostly beaked at one or both ends, sometimes oblique, densely covered with soft, tomentulose tubercules, 4–5 cm long, the mesocarp soft, sweet; seeds mostly 2, discoid, 2–3 cm long, enclosed in a reddish brown, chartaceous (dried) septum.

This species ranges from Costa Rica to Peru. It is found in tropical wet and moist forests, chiefly as an understory tree. *Rheedia acuminata* may be distinguished from other Panamanian species by its tuberculate fruit, its numerous veins, its usually smaller and narrower leaves, and by the marginal vein which may be distinguished with the naked eye only 0.5 mm from the margin.

In this species the lateral veins are slightly ascending and slightly arcuate to near the margin. The cross veins appear to be continuous, forming a vein-like series of lines more strongly ascending and arcuate than the lateral veins. A number of African species currently recognized under *Garcinia* have this series of cross veins more prominent than the lateral veins, an interesting morphological development which emphasizes the affinity of these African elements to neotropical members of *Rheedia*.

CANAL ZONE: Barro Colorado Island, *Croat 8240, 10840* (both MO, SCZ); *Foster 1780* (DUKE, PMA); *Hladik 431* (MO, US); *Kenoyer 669* (US); *Shattuck 668* (MO, US); *Standley 31304, 40792* (both US); *Starry 46* (MO); *Wetmore & Abbé 112* (MO); *Zetek 4626* (MO), *4627* (MO, SCZ, US). Pipeline Road, *Gentry 7398* (MO). Frijoles, *Pittier 3750* (US). Quebrada Fea, tributary of Río Chagres, *Smith & Smith 3402* (PMA). CHIRIQUÍ: Cerro Horqueta, 1200–1700 m, *Pittier 3162* (US). COCLÉ: Santa Rita Ridge, *Croat 13847* (DUKE, MO). Salud Hills, *Lao & Holdridge 190* (MO, PMA). DARIÉN: Cerro Pirre, *Bristan 571* (MO). Paya, *Stern et al. 393* (US). PANAMÁ: Cerro Azul, *Dwyer 1344* (MO), *1364* (SCZ). Altos de Pacora, *Mori & Kallunki 4971, 2566* (both MO).

2. **Rheedia edulis** (Seem.) Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 310. 1860.—FIG. 8A.

Calophyllum edule Seem., Bot. Voy. Herald 89. 1853. TYPE: Veraguas, Panama, *Seemann* (BM, not seen; MO, photo).

Glabrous *trees* to 10 m tall; sap yellow; twigs drying conspicuously ridged, older branches often somewhat reddish, sometimes smooth and grayish. *Leaves*

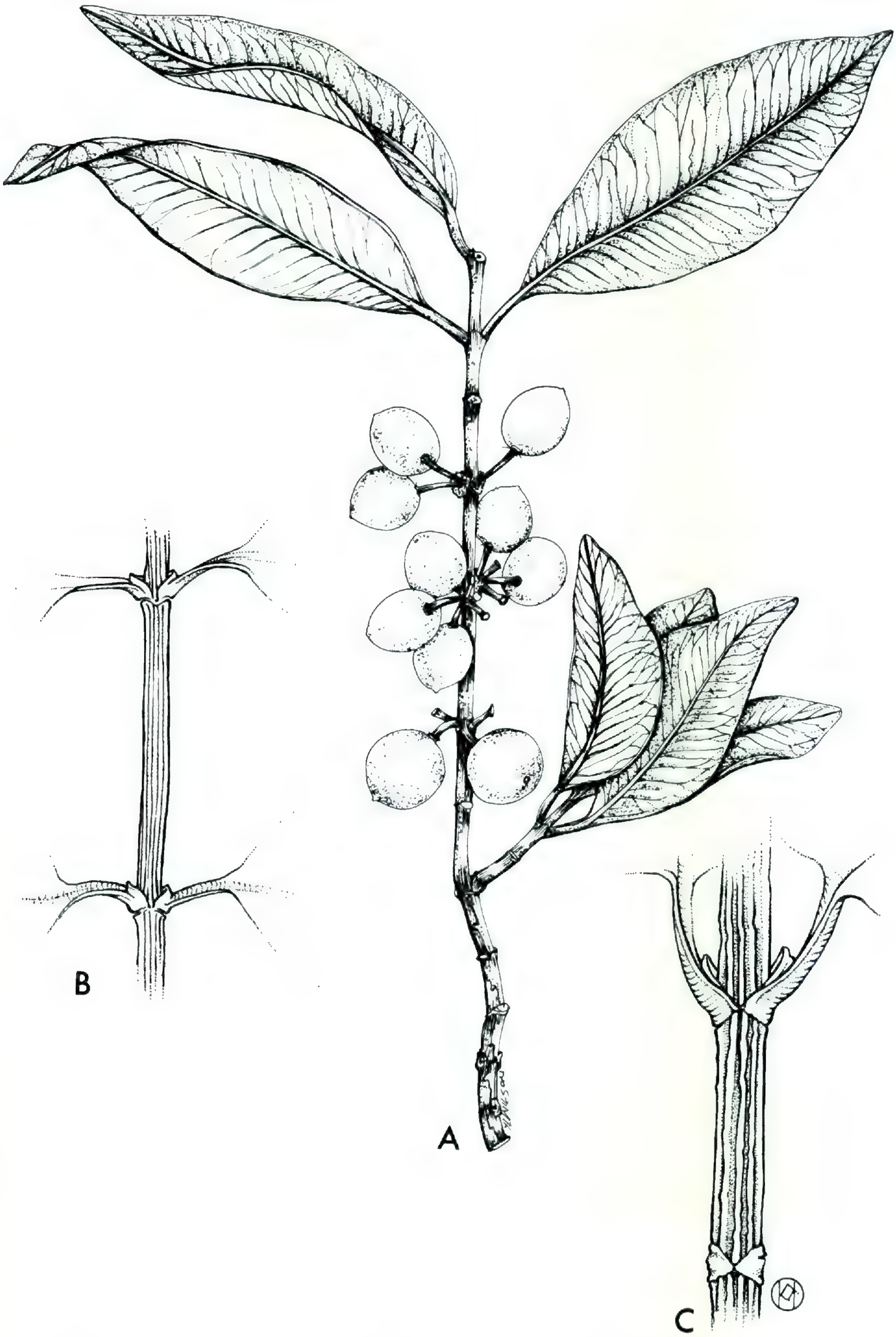

FIGURE 8. *Rheedia*—A. *R. edulis* (Seem.) Pl. & Tr. Fruiting branch (×3/5). [After *Croat 5602* (SCZ).—B. *R. lateriflora* L. Stem showing ridging (×3/5). [After *Croat 4468* (MO).]—C. *R. macrophylla* (Mart.) Pl. & Tr. Stem showing ridging (×3/5). [After *Rodriguez 426* (MO).]

coriaceous, narrowly elliptical, mostly 15–25 cm long, 5–7 cm wide, apically and basally acute, the margin drying slightly revolute, the costa prominent, elevated above and beneath, above rounded or slightly flattened proximally, angled beneath, the lateral veins numerous, parallel, mostly well spaced, ca. 3 per cm, ca. 6 per cm including intermediate veins, the lateral veins anastomosing and forming a reticulum near the margin, the minor venation obscure above, slightly elevated beneath, the submarginal vein not distinguishable from the margin when viewed from above; petiole mostly 10–15 mm long, at first drying reddish brown and fine wrinkled, later darker and somewhat grayish brown, canaliculate above, the margins sharp-angled, sometimes the pairs forming a nodal ridge. *Flowers* polygamous, fasciculate at the nodes of fallen leaves, the fascicles many-flowered; pedicels slender, 5–8 mm long, longer in fruit. *Flowers* ca. 5 mm across, sepals 2, coriaceous, cucullate, apically erose to repand; corolla white, the petals 4, the limb reflexing over the sepals, round-keeled and erose margined, 4 mm long, decussate, the outer pair alternate with the sepals; stamens ca. 15 arranged cyclically or in 2–3 whorls, the filaments free, slender, glabrous, ca. 2 mm long, basally thickened at insertion, the anthers 2-thecate, the thecas ellipsoidal, ca. 0.2 mm long, dorsifixed, not versatile, the thecas dorsally connate, drying red-brown, the longitudinal dehiscence forming an elliptical pore; pistil small, the ovary not evident at anthesis, covered by the sessile stigmas, the stigmas irregularly curved, ca. 1.5 mm across. *Fruit* a globose or ellipsoidal red or orange drupe 1.5–2.5 cm across, often in large clusters, smooth, minutely apiculate; seeds faboid, dark red, 1.5–2 cm long, 9–10 mm wide, the mesocarp white, adhering to the seeds, the seed enclosed in a reddish fibrous material.

Rheedia edulis ranges from Mexico to Panama. It is distinguished by its small, smooth, yellow or orange fruits, and by its pointed narrow leaves. The venation appears to be more widely spaced and less prominent than in leaves of comparable size on other Panamanian species. In Panama, *Rheedia edulis* grows in the understory of forests in moist and wet lowlands. The fruit is commonly eaten by man and monkeys, but they do not often become a market item.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 6a* (US). CANAL ZONE: Barro Colorado Island, *Croat 5602* (DUKE, SCZ), *8354, 11129* (both SCZ), *13921* (DUKE, PMA, SCZ), *14454, 14652* (both SCZ); *Foster 561* (PMA), *2184, 2209* (both DUKE, PMA); *Hladik 400* (US); *Shattuck 1102* (US); *Zetek 3758* (MO). Madden cave area, *Tyson et al. 6246* (PMA). CHIRIQUÍ: Progreso, *Cooper & Slater 160* (US). Sabana de la Tortuga between Boquete and Caldera, 300–700 m, *Pittier 3344* (US). Between Cerro Vaca and Hato del Loro, 850–1100 m, *Pittier 5399* (US). COCLÉ: Hills S of El Valle de Antón, 700 m, *Allen 2474* (US). Penonomé, *Williams 378* (US). DARIÉN: Cerro Pirre, *Bristan 568* (MO). Río Uruceca, *Bristan 1458* (MO). N of Santa Fé, *Duke 10242* (MO). Near Estero Grande off Río Marea, *Duke 10959* (MO). Without other locality, *Tyson et al. 4752* (DUKE). 3 mi E of Santa Fé, *Tyson et al. 4671* (MO, PMA, SCZ, US). HERRERA: 4 mi S of Los Pozos, *Tyson 2647* (DUKE, MO, SCZ). LOS SANTOS: Azuero Peninsula between Jobero and headwaters of Río Pedregal, 300–700 m, *Croat 34462* (MO). Tonosí, *Stern et al. 33650* (US). 11 mi N of Tonosí, *Tyson et al. 2981* (SCZ). PANAMÁ: El Llano, *Duke 5809* (MO). Cerro Jefe, *Foster & Kennedy 1825* (DUKE, PMA). 5 mi W of Chepo near Panamerican Highway, *Tyson 6703* (PMA). VERAGUAS: La Yeguada, Calobre 653 m, *Lao 601* (MO). N of Santa Fé, N of Escuela Agricola Alto de Piedra, *Mori & Kallunki 2566* (MO), *3721* (MO, SCZ), *4893* (MO).

3. **Rheedia lateriflora** L., Sp. Pl. 1193. 1753. Based on *Vanrheedia* Plumier, Nov. Pl. 45. 1703, not *Garcinia lateriflora* Blume (1825).—FIG. 8B.

Vanrheedia Plumier, Nov. Pl. 45. 1703. TYPE: Martinique, *Plumier* (P, fide Pl. & Tr., not seen).
Mammea humilis Vahl, Eclog. Amer. 2: 40, *t. 20.* 1798. TYPE: Montserrat, *Ryan* (? C, not seen; MO, microfiche).
Rheedia sieberi Choisy, Descr. Guttif. Inde 47, *t. 5.* 1849. TYPE: Trinidad, *Sieber 56* (MO).
Mammea humilis var. *vahlii* Griseb., Fl. Brit. W. Indies 108. 1859. Based on *M. humilis* Vahl.
M. humilis var. *plumieri* Griseb., Fl. Brit. W. Indies 108. 1859. Based on *Rheedia* Plumier, Pl. Amer. 255, *t. 257.* 1760.
Rheedia sessiliflora Planch. ex Vesque, Epharm. 2, *t. 62.* 1889; in A. DC. Monog. Phan. 8: 50. 1893. TYPE: Jamaica, *Purdie* (K, not seen).
Garcinia humilis (Vahl) C. D. Adams, Phytologia 20: 312. 1970.

Glabrous *shrub* or *tree* to 10 m tall; sap yellow; twigs stout, drying moderately sulcate. *Leaves* coriaceous, thick, ovate or elliptical, 15–28 cm long, 6–12 cm wide, apically obtuse or acute, often umbonate, the tips falcate, basally obtuse or rounded, the margin often slightly revolute, the costa prominent and sharp-angled beneath, plane or slightly raised above, the lateral venation prominent, ca. 3 veins per cm, 5–6 per cm including intermediate veins, little branched to near the margin and then forming a loose, open reticulum, elevated on both sides, the submarginal vein scarcely distinguishable from the margin; petiole 1–2 cm long, stout. *Inflorescences* fasciculate in the axils of fallen leaves, drying reddish brown; pedicels 7–10 mm long, slightly longer and stouter in fruit. *Flowers* 9–15 mm across; sepals 2(–3–4), 1.5–2 mm long; petals white or yellowish, petals 4, 6–8 mm long, rotund, cucullate, slightly coriaceous, slightly unequal; stamens 12–25, the filaments free, the anthers minute, opening longitudinally by broad apical slits; style short or obsolete, the stigmas 3–4, covering the young ovary. *Fruit* ellipsoidal to globose, yellow, acuminate-beaked at each end, 3–4 cm long; seeds 1–3, ca. 2.5 cm long.

This species ranges through the Antilles from Hispaniola to Trinidad. It is known to Panama from only a few collections, taken in wet forest near the Caribbean coast. *Rheedia humilis* may be distinguished by its large thick coriaceous leaves and large, smooth, beaked, yellow fruit. The leaves are similar to those of *Garcinia mangostana* but only one submarginal vein is present, situated right at the margin, not two such veins situated well in from the margin.

Rheedia lateriflora is highly suggestive of *Mammea,* and in fact, Grisebach united the genus *Rheedia* with *Mammea* based on the appearance of this species. In the controversy following (Grisebach, 1861; Planchon & Triana, 1861) Planchon and Triana recorded that the cotyledons and the perianths in the two genera are quite different and that this species does indeed belong in a distinct genus, *Rheedia,* Planchon and Triana placed *Rheedia* and *Mammea* in different tribes.

COCLÉ: N of El Copé, 750–900 m, *Croat 44648* (MO); *Folsom 1347* (MO).

4. **Rheedia macrophylla** (Mart.) Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 309. 1860.—FIG. 8C.

Garcinia macrophylla Mart., Flora 24. 2. Beibl. 35. 1841. TYPE: Brasil, *Martius,* not seen.
Rheedia benthamiantha Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 320. 1860. SYNTYPES: Guyana, *Schomburgk 523, 990* (?P, neither seen).

R. sagotiana Engler in Mart., Fl. Brasil. 12(1): 460, *t. 102*. 1908. TYPE: Guyana, *Sagot 1182* (W, not seen; MO, photo).
R. magnifolia Pittier, Contr. U.S. Natl. Herb. 13: 454. 1912. TYPE: Costa Rica, Pittier, Aug. 1901 (US-578033, not seen).

Tree to 10 m tall; twigs drying strongly angled sulcate; sap yellow. *Leaves* ovate, apically short acuminate, basally truncate or obtuse, 15–40 cm long, 7–15 cm wide, stiff coriaceous, concolorous, mostly drying brown, shiny above, the costa plane or slightly impressed above, elevated and angled beneath, lateral veins mostly 4–10 mm apart, irregularly spaced, arcuate near the margin forming an inconspicuous submarginal vein 1–2 mm from the margin; petioles stout, often triangular, 1–2 cm long but sometimes wanting, with a conspicuous flap of axillary tissue forming a pit, the surface drying yellowish crinkled. *Inflorescence* fasciculate at the nodes or leaf axils; pedicels lax, ca. 2 cm long. *Flowers* (Pittier) small, pale yellow, sepals 2, 5 mm long; petals 4, ovate, 11–12 mm long; stamens numerous, ca. 30, inserted at the base of the disc, the anthers 0.5 mm long; disc ca. 4.5 mm across, hemispherical, muriculate; pistillate flower with ca. 25 stamens, perhaps biseriate, the ovary turbinoid drawn into a pronounced stout style, the stigma flat, peltate. *Fruit* yellow or orange, turbinoid, lemon shaped, ellipsoid or globose, smooth or rough outside, apiculate or the stigmas depressed, the pulp thick; seeds 1–4, ellipsoidal or faboid.

This species is distinct in its large, stiff, coriaceous leaves which usually dry shiny above. In plants from near Puerto Obaldía, some leaves are sessile while others on the same tree have petioles to ca. 2 cm long. The fruit is variable in shape, from globose to lemon shaped, and the seeds vary from 1 to 4 (?5). There is also a strong tendency for the stems to dry angled sulcate and nearly hollow.

The name *Rheedia macrophylla* is used for this species with hesitation, and all the Panamanian material cited here may not be the same species. A photograph of the type collection reveals narrower leaves: the type of *Rheedia sagotiana* is more like the material described here.

This species may be difficult to separate from some collections of *Garcinia pictorius* which also has similar fruits. The leaves of *G. pictorius* are usually narrow, mostly oblong rather than ovate. *Rheedia macrophylla* leaves generally have shorter and stouter petioles than those of *R. lateriflora*, and the veins are usually farther apart.

COLÓN: Santa Rita Ridge road, 14 km from Boyd-Roosevelt Highway, *Mori & Kallunki 4923* (MO). PANAMÁ: Cerro Azul, *Rodríguez 426* (MO, PMA). SAN BLAS: Hills of Sperdi near Puerto Obaldía, 20–200 m, *Pittier 4343* (US). Coastal bluffs between Puerto Obaldía and Puerto Armila, *D'Arcy & Hahn 13673* (MO).

10. SYMPHONIA

Symphonia L. f., Suppl. 302. 1781. TYPE: S. globulifera L. f.

Trees or *shrubs*; sap yellowish, glabrate. *Leaves* opposite, mostly apically acuminate (Panama) or sometimes rounded, pinnately nerved; stipules wanting. *Inflorescences* few-flowered cymes or solitary flowers, often condensed, terminal or axillary. *Flowers* perfect, red or pink; sepals 5, imbricate, the outer 2 smaller; petals 5, contorted, arranged in a globose bud; disc extrastaminal, cupulate; fil-

aments forming a column apically separating into 5 parts opposite the petals, each staminal element bearing 2–5 anthers, the anthers linear, dehiscent by lateral slits; ovary 5-locular, the ovules 2–8 per carpel, ascending, the style elongate, peg-like, apically 5-lobed, the stigmas minute, porate. *Fruit* pink or red, baccate, globose or ovoid few seeded, lacking endosperm, the embryo thick, entire and lacking cotyledons.

Symphonia, the only genus in tribe Moronobeae occurring in Panama, is distinct in its perfect flowers, contorted sepals, connate androecium, and globose red or pink flowers and fruits. The genus is represented in the New World tropics, Africa and Madagascar by *S. globulifera*, and in Madagascar more than a dozen endemic species have been recorded, some of which may be valid. The sap is used for caulking and the timber for construction.

1. **Symphonia globulifera** L. f., Suppl. 302. 1781. TYPE: Surinam, *Dalberg* (LINN 853.1, not seen; MO, microfiche).—FIG. 9.

Tree to 30 m tall; sometimes stilt-rooted; sap yellow. *Leaves* oblong to lanceolate, often slightly wider above the middle, apically acuminate, basally obtuse or acute, 4–6 cm long, 1.5–3 cm wide, the costa impressed above, elevated beneath, the lateral nerves numerous, straight, parallel, slightly ascending, often abruptly forking near the margin to form an inconspicuous continuous submarginal vein, chartaceous, often slightly grayish; petiole short but distinct, 3–5 mm long. *Inflorescence* condensed and subumbellate, cymose peduncle mostly obsolete but sometimes 2–3 cm long; bracts wanting; bracteoles obsolete; pedicels straight, ca. 1 cm long. *Flowers* depressed globose, pink or red, ca. 1.5 cm across; sepals 5, quincuncial, rotund, broader than long, ca. 5 mm long; petals rotund, ca. 10 mm long, imbricate, contorted; filaments exserted, forming a narrowly turbinoid column around the ovary, apically splitting into 5, white strap-like elements, the anthers 3 per segment, linear, abaxial on the segments, dehiscing longitudinally by lateral slits; ovary 5-locular, turbinoid, produced into the style, the style apically divided into 5 porrect linear lobes which alternate with the anther connectives, white, stigmas minute, distal on the style lobes and directed downwards, minute. *Fruit* subglobose, 2–4 cm long, surmounted by the persistent style and branches, leathery, brownish or yellowish; seeds 1(–3), red, ellipsoid to subglobose.

This species occurs as an understory shrub but ultimately reaches large size becoming one of the largest forest trees. The pink or red globose flowers, which are often very abundant, are conspicuous.

The yellowish sap of this tree dries into a dark gum which is sometimes used for caulking boats. The timber is suitable for veneers and rough carpentry.

Symphonia globulifera is widespread in tropical America, Africa and Madagascar, showing little variation throughout its range. In Panama it occurs mostly along the Caribbean watershed at lower elevations.

BOCAS DEL TORO: Dwedulup Peak N of Río Terebe across from Quebrada Huron, 300–900 ft, *Kirkbride & Duke 557* (MO). Shores of Laguna de Chiriquí, 150 ft, *Stern & Chambers 51607* (MO). Water Valley, *Wedel 758, 915* (both MO). Chiriqui Lagoon, *Wedel 1030, 1100, 1141, 1210* (all MO).

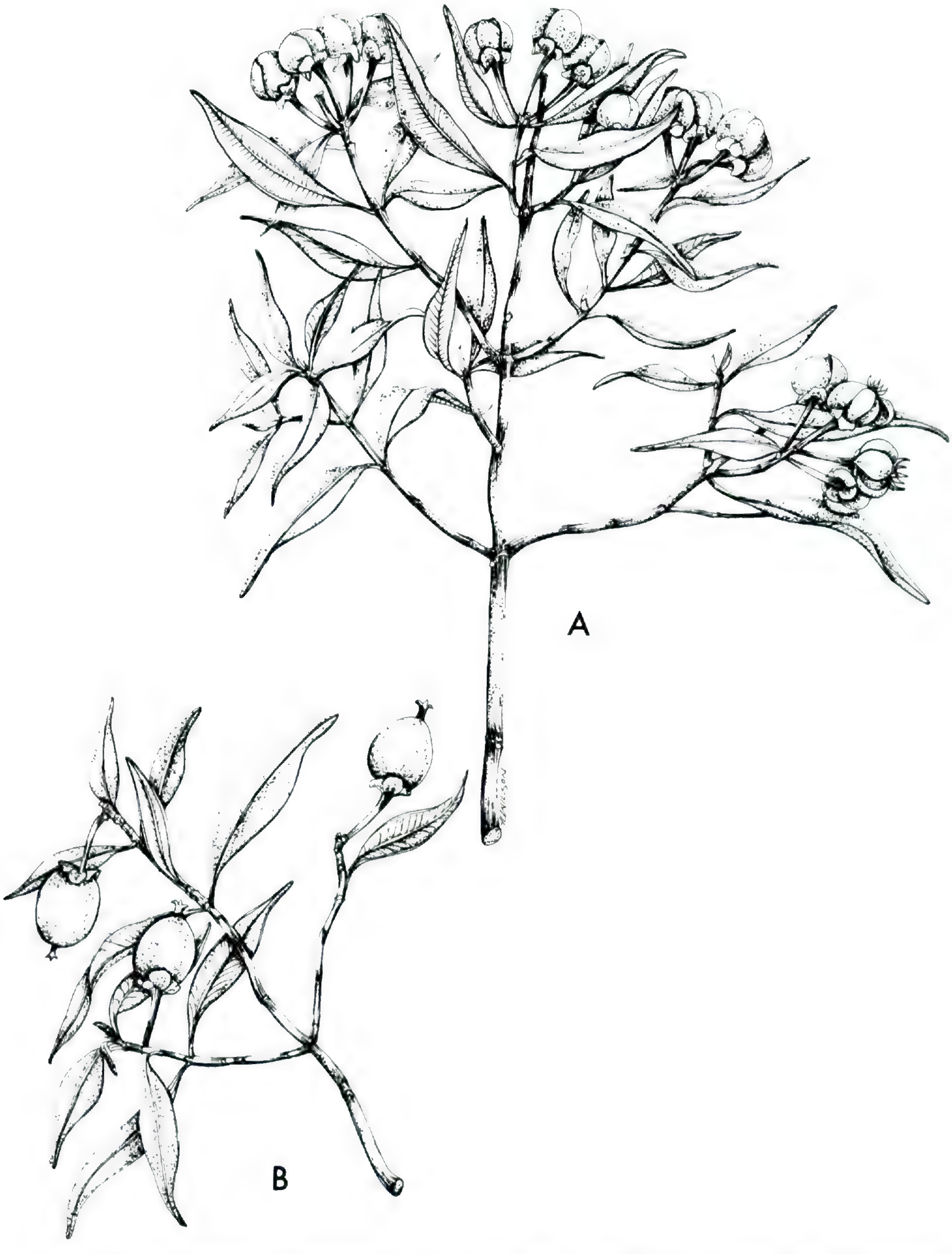

FIGURE 9. *Symphonia globulifera* L.f.—A. Flowering branch (×3/5). [After *Mori & Kallunki 2860* (MO).]—B. Fruiting branch (×3/5). [After *Dressler & Williams 3964* (MO).]

Water Valley, *Wedel 1463* (MO). Little Bocas, *Wedel 2496* (MO). CANAL ZONE: Barro Colorado Island, *Croat 8686* (DUKE, MO, SCZ), *9517* (MO); *Foster 943* (PMA). COCLÉ: Albo Calvario [Above El Copé], 600–800 m, *Folsom 3174* (MO). COLÓN: Cerro Santa Rita, 1200–1500 ft, *Allen 5101* (MO); *Correa & Dressler 1085, 1205* (both DUKE, MO, PMA); *Croat 15337* (MO); *Dressler 3412* (PMA). Santa Rita lumber road, *Dressler & Williams 3964* (MO). Cerro Santa Rita, 1200–1500 ft, *Dwyer 8580*

(MO, SCZ). Santa Rita lumber road, *Dwyer 8584* (MO). Cerro Santa Rita, 1200–1500 ft, *Foster 1738* (DUKE, MO, PMA); *Gentry 6557* (MO, PMA). Salud, *Lao & Holdridge 240* (DUKE, MO, PMA). DARIÉN: Cerro Tacarcuna, west ridge, *Gentry & Mori 14116* (MO). PANAMÁ: Cerro Azul, *Dwyer 1507* (MO). 5–6 mi N of El Llano, *Gentry 5814* (DUKE, MO). Road from El Llano to Cartí, *Kennedy & Dressler 2951* (MO). El Llano-Cartí road, 350 m, *Mori & Kallunki 2860* (MO), *3539* (MO, PMA). SAN BLAS: Trail E of Cangandí-Mandinga airport road, *Duke 14787* (MO, OS). VERAGUAS: Cerro Tute, *Mori 6268* (MO).

11. TOVOMITA

Tovomita Aubl.,[10] Hist. Pl. Guiane Franç. 2: 956, *t. 364*. 1775. TYPE: *T. guianensis* Aubl.

Monoecious or dioecious *trees* or *shrubs*, glabrate, stems sometimes buttressed or stilt rooted, sap often white or yellowish. *Leaves* at first opposite, soon becoming alternate, entire, simple, drying minutely revolute, the costa elevated beneath, lateral nerves sometimes forming a submarginal vein; petioles sometimes short, flat or canaliculate above; stipules or pseudostipules wanting, axillary buds not normally conspicuous. *Inflorescences* cymose panicles, mostly terminal, often pyramidal, basally subtended by a pair of minute to foliaceous bracts which rarely envelop the entire inflorescence in bud, the branching mostly opposite or ternate, bracteoles mostly present, small and cucullate, subtending the pedicels and parts of the rachis; pedicels often thickening but not much elongating in fruit. *Flowers* with the buds minutely apiculate, completely enclosed in the outer sepals which are fused to the top showing only indistinct sutures, splitting lengthwise into 2–4 opposite, cucullate, coriaceous segments (sepals), an inner whorl of sepals sometimes present, the complete calyx consisting of 2–8 decussate sepals, the inner series imbricate apically and overtopping the bud; corolla sometimes fused in bud and splitting lengthwise to yield the 2–8 segments (petals), or the petals free and distinct in bud, imbricate and overtopping the bud, opposite and decussate; stamens numerous, the filaments free, slender or stout, glabrous, the anthers small, the 2 lobes separated by the connective, each lobe 2-locular with a thin septum, the connective sometimes produced into a minute apiculum; ovary conical or obtuse, sometimes sulcate, 4–5-carpellate, syncarpous, the styles short or produced into prongs in fruit, the stigmas ovoid to discoid, stigmatic abaxially; ovules 1 in each locule, axile, medifixed, anatropous or perhaps campylotropous, enveloped in a fleshy, venose aril, the aril and lower portion of the ovule sometimes produced into a spur filling a cavity in the base of the locule. *Fruit* a fleshy, drupaceous capsule, dehiscent septicidally to the base, often brightly colored within; seeds 1 per locule or fewer by abortion, oblong, ellipsoidal or faboid in shape, enveloped by the fleshy aril, the testa wanting, one end sometimes produced into a basal spur.

Tovomita is a genus of one or two dozen species from tropical South America and the Antilles ranging as far west as Panama (?Costa Rica). Although it has been confused with *Tovomitopsis*, *Chrysochlamys*, and *Dystovomita*, it is apparently distinct in several features. The outer perianth is complete in preflora-

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[10] A number of synonyms of *Tovomita* were published in the last century; only this name has been used for Panamanian plants.

tion, that is, it is completely fused and the sepals are schizogenous products of longitudinal tearing. The ovules are reportedly anatropous but appear to be camplyotropous instead, a feature which could not be verified at this time. They are inserted about halfway up the carpel wall, and the funiculus joins the ovule at about the middle with the raphe directed downwards. In the case of *Tovomita weddelliana* and perhaps other species not studied at this time, this lower end of the ovule is produced onto an acute spur which fills an elongation of the locule into the basal region of the carpel. An aril completely envelops the seed, which is fixed at the point of ovule attachment but is otherwise free. This aril is conspicuously venose, the veins running outwards from the point of attachment. The testa is extremely thin or wanting. According to Engler, to Planchon and Triana, and other earlier writers, the fleshy structure in *Tovomita* is not a true aril, and they preferred the term arilloid. It is actually a fleshy elaboration of the integuments or a sarcotesta and not an outgrowth of the funiculus as in related genera where the term aril may be applied in a strict sense. The term aril is used here in the ecological sense to cover any fleshy, colored seed appendage deployed as an attractant for dispersal.

The species of *Tovomita* occurring in Panama are quite distinct from one another; two of them, *T. stylosa* and *T. weddelliana,* are also distinct in the genus and atypical of the majority of species.

In addition to the three species noted below, material of at least two other species has been collected in Panama. These could not be assigned to any known species, but material is not sufficient to warrant description of new species.

a. Leaves appearing sessile but at the very base abruptly narrowed into short, stout petioles.
   b. Leaves narrow, the lateral veins numerous without cross veins, less than 3 mm apart; fruit obturbinoid, smooth ---------- 4. *T. weddelliana*
   bb. Leaves broad, the lateral veins well spaced with evident cross veins, more than 8 mm apart; fruit globose, warty ---------- 2. *T. morii*

aa. Leaves narrowed into slender petioles.
   c. Flower buds elongate, narrow; drying green; leaves membranaceous or chartaceous; stamens fewer than 60 ---------- 3. *T. stylosa*
   cc. Flower buds globose or ovoid, drying brown; leaves coriaceous; stamens ca. 80 ---------- 1. *T. longifolia*

1. **Tovomita longifolia** (L. C. Rich.) Hochr., Ann. Conserv. Jard. Bot. Genève 21: 66. 1919.

Clusia longifolia L. C. Rich., Actes Soc. Hist. Nat. Paris 1: 113. 1792. TYPE: Guiana, *Richard* (?P, not seen; ?G, ?G-DC, neither seen; MO, photos).

Micranthera clusioides Choisy, Mém. Soc. Hist. Nat. Paris 1: 224, *t. 11, 12.* 1822 [1823] pro parte, excl. typ.

Tovomita richardiana Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 273. 1860. New name for *Clusia longifolia* L. C. Rich.

Stilted *tree* to 15 m tall, twigs stout, new growth drying yellowish, older growth drying gray, glabrous; latex cream or yellow. *Leaves* somewhat coriaceous, obovate, to 20 cm long, 8 cm wide, apically obtuse or rounded, basally acuminate or obtuse, minutely revolute, the costa nearly plane above, elevated beneath, the lateral veins 6–7, arcuate-ascending, wider spaced upwards, ascending at the margin but not forming a submarginal vein, minor venation obscure, consisting of 1–2 ill-spaced intermediate lateral veins and numerous veins

pinnate on the laterals, linear canals sometimes evident beneath; petiole 10–40 cm long, ca. 2 mm wide, nearly flat above. *Inflorescences* terminal, pyramidal to rotund, subtended by pairs of normal leaves; rachis stout, drying yellowish brown, to ca. 6 cm long; bracteoles deltoid or obtuse, ca. 2 mm long, the margins hyaline; pedicels 5–8 mm long, stout. *Flowers* unisexual, the buds ovate to globose, the minute sepal tips forming an apicule, ca. 7 mm long, reddish brown, finely striate, calyx prefloration complete, splitting to the base into 2 outer sepals, the sepals reflexed, boatlike or spathulate, ca. 8 mm long, coriaceous, the 2 inner sepals similar but slightly larger with hyaline margins; petals 4–7, thinner, narrower; stamens numerous (ca. 80), the filaments 2–4 mm long, slender, subterete, erect in bud, the anthers elongate, the lobes parallel, the connective slightly emergent and apiculate; ovary not examined (obsolete in staminate flowers). *Fruit* ultimately subglobose or pyriform, 5 cm long, 3 cm across, sulcate, apiculate, the apex prolonged by the 5 connate styles and sometimes appended by 5 persistent cuneiform patent stigmas, the base drawn into a stout subterete stipe, subtended by the persistent, erect, patent or reflexed outer perianth and stamens; valves oblanceolate, to 5 cm long, 2 cm wide; seeds 5 or by abortion fewer, filling the locules which occupy the globose, central portion of the fruit.

The flowers of this species are reported as white or yellow-green, the fruit is reportedly rose-red or bright red with a fleshy, yellow, brick or orange colored covering and the interior red.

Tovomita longifolia is sometimes confused with *Tovomitopsis nicaraguensis* and other species of that genus, but the appearance of the flower buds distinguish it easily. It also shows less tendency to dry brown, and the fruits are much larger. In addition, the inflorescence of *Tovomita longifolia* is glabrous but is minutely puberulent in species of *Tovomitopsis* which resemble it.

Tovomita longifolia occurs in lowland Panama, and it ranges through the Guianas to Brasil.

CANAL ZONE: Barro Colorado Island, *Croat 9214* (MO), *14016* (MO, SCZ), *14452* (MO); *Dare 1115* (MO); *Foster 763, 2248* (both DUKE, PMA). COLÓN: Santa Rita Ridge, *Mori & Kallunki 3052, 6310* (both MO). DARIÉN: Upper gold mining camp of Tyler Kittredge, Río Tuquesa ca. 2 air km from continental divide, *Croat 27209* (MO). PANAMÁ: N of Indio Tower, W of Limon Bay, Gatun Locks and Gatun Lake, *Johnston 1794* (MO). Saddle on SE slope between peaks on Cerro Trinidad, *Kirkbride & Duke 1647* (MO). Cerro Jefe, *Mori 8004* (MO). SAN BLAS: Permé, *Cooper 285* (US).

2. **Tovomita morii** Maguire, Phytologia 39: 76. 1978. TYPE: Panama, *Mori et al. 4685* (MO, holotype; NY, isotype, fide Maguire, not seen).

Shrub, perhaps epiphytic; twigs slightly compressed, glabrous, stout; sap yellow, sticky. *Leaves* obovate, 20–30 cm long, 10–15 cm wide, apically obtuse, minutely umbonate, basally obtuse and abruptly narrowed into the petiole, the costa subplane and evanescent distally above, elevated beneath, the lateral veins nearly straight, arcuate into the margin, not forming a discernable submarginal vein, mostly 1–2 cm apart with numerous wavy cross veins running tangentially to the leaf base; petioles short, stout, 5–10 mm long, with an axillary flap. *Inflorescences* probably much reduced, the main axis 2–3 mm long, the pedicels greatly enlarging in fruit. *Flowers* with the bud depressed-globose, 10–15 mm across (after Maguire), sepals 4, decussate, the outer pair longer and including the inner

pair, ovate, oblong, 10–12 mm long, subcoriaceous; petals not seen; stamens 3-seriate, free, linear, sublaterally compressed, 3.5–4 mm long, ca. 0.5 mm wide, the anthers lateral at the filament tips, ca. 1 mm long; pollen not seen; ovary 5-locular, the ovules solitary, basally fixed. *Fruit* obovoid to subglobose, 4–5 mm long, conspicuously brown flecked; seeds ca. 1 cm across.

This species is distinct in its leaf venation. The lateral veins are widely spaced and arcuate at the margin without forming an evident submarginal vein, and the numerous wavy cross veins are somewhat ascending from the lateral veins. Details of the flower are taken from Maguire's description for there are no flowers with the two collections available at MO. It is not certain whether this species belongs to *Tovomita* or to *Tovomitopsis*, but the decussate outer sepals which are slightly parted on the one bud present is suggestive of *Tovomita*.

PANAMÁ: El Llano-Cartí road, *Busey 370* (MO); *Mori & Kallunki 4685* (MO).

3. **Tovomita stylosa** Hemsl., Biol. Cent.-Amer. 1: 88. 1879. LECTOTYPE: Panama, *Fendler 298* (K, not seen; MO, dupla).

T. pauciflora Cuatr., An. Inst. Biol. Univ. Nac. México 20: 104. 1949. TYPE: Colombia, *Cuatrecasas 13302* (F, not seen; US, dupla).

Glabrous, monoecious, small *tree* to 8 m tall, apparently lacking milky sap; stems slender. *Leaves* ovate or elliptical, mostly 10–15 cm long, 3–5 cm wide, membranaceous, apically short acuminate, basally obtuse or acuminate, the costa prominent, narrow, often impressed above, elevated beneath, lateral veins 8–11, arcuate, not anastomosing or forming a continuous submarginal vein, minor venation slightly elevated on both sides, consisting of 1–2 intermediate lateral veins and one or more strongly ascending, somewhat irregular veins pinnate from the major lateral veins, a reticulum of smaller veins also present; petiole slender with narrow wings forming a ventral channel. *Inflorescence* terminal, a short panicle or fascicle of short cymose panicles, often subtended by a small lead, the peduncle slender, drying strongly angled, to 4 cm long; bracteoles narrow, cucullate, ca. 1 mm long; pedicels 5–10 mm long. *Flower* buds narrowly cylindrical, to 10 mm long, 3 mm wide, the pistillate buds slightly shorter and broader, often falcate; calyx ca. 8 mm long, connate tips splitting lengthwise to form 2 narrowly oblong, often reflexed sepals, corolla greenish, the petals 4, connate in bud, narrowly oblong, the margins thin, slightly inrolled; stamens numerous (ca. 47), ca. 6–9 mm long, free, the anther lobes ca. 0.5 mm long. *Fruit* pyriform, stipitate, ca. 25 mm long, 5–8 mm wide, surmounted by the conspicuous slender styles 4–6 mm long, drying sulcate, dark brown with lighter, warty spots, the valves red inside; seeds 4, narrowly ovoid, smooth, tipped with an orange or red aril.

Tovomita stylosa may be recognized by its narrow flowers and buds and by the pronglike, persistent styles on the fruit. The leaves tend to have more intermediate veins than other species of *Tovomita*.

This species is closely related to *T. tenuiflora* Benth. of Venezuela, which has much larger leaves and larger inflorescences. These two species are somewhat isolated from other members of the genus with their elongate buds and only 2 sepals. The connate petals are also unusual.

Tovomita stylosa ranges from Panama (?Costa Rica) to Venezuela, Ecuador and Brasil. It grows in moist and wet forests.

CANAL ZONE: Woods off S-5 road, Atlantic side, *Blum et al. 415* (SCZ). Barro Colorado Island, *Croat 11164* (MO, SCZ), *11865* (MO); *Croat & Oppenheimer 1521* (MO); *Ebinger 1140* (MO); *Foster 1485* (MO, PMA, SCZ), *1799* (DUKE, PMA, MO); *Knight 1026* (MO, SCZ), *2002* (MO). Boy Scout Road, Madden Dam area, *Dwyer 6941* (MO). Between Chilibre and Madden Dam, *Dwyer & Correa 8409* (MO). Chagres, *Fendler 298* (MO). Coco Solo, *Gentry 6067* (MO). Between Pipeline Road and Frijoles, *Gentry 7463* (MO). Near Maru Towers, W of Limon Bay, Gatun Locks and Gatun Lake, *Johnston 1549* (MO). Indio, Madden Lake, *Miller 2053* (US). Near summit of Cerro Pelado, 1 km N of Gamboa, *Nee 9061* (MO). Between Gatun and Lion Hill, *Pittier 2564* (US). Fort Sherman, *Tyson & Chu 1698* (MO, SCZ); *Tyson & Dwyer 1230* (MO, SCZ). COCLÉ: La Mesa above El Valle, *Croat 37360* (MO). COLÓN: Santa Rita Ridge lumber road, *Correa 767* (MO, PMA); *Correa & Dressler 787* (PMA), *1093* (MO, PMA); *Dwyer 8409* (MO); *Gentry 6569, 8831* (both MO); *Mori & Crosby 6415* (MO); *Mori & Kallunki 3047, 5061* (both MO); *Nee & Hale 9675* (MO). DARIÉN: Río Yape, *Bristan 1375* (MO). Río Pirre, *Bristan 1477* (MO). Old gold mine at Caná, *Croat 27305* (MO). Summit camp between Sasardí and Mortí, 400 m, *Duke 10041* (MO). Slopes of Cerro Pirre, 500–1000 m, *Gentry & Clewell 7120* (MO). Between Tres Bocas and Cerro Campanimento, *Kirkbride & Duke 1352* (MO). PANAMÁ: 1 mi después de La Eneida, Cerro Jefe, *Correa & Dressler 949* (MO). 10 mi from Interamerican Highway on road to Cerro Jefe, *Croat 15190* (SCZ). Cerro Azul, *Croat 17294* (MO). Campo Tres, 3 mi NE of Altos de Pacora, 500–800 m, *Croat 22724* (MO, US). El Llano-Cartí Road, 10 mi from El Llano, *Croat 33713* (MO). Cerro Azul, *Dwyer 2188* (MO). Cerro Jefe, *Dwyer 3431* (NY). El Llano-Cartí road, *Folsom & Collins 1508, 1510* (both MO). Valley between Cerro Azul and Cerro Jefe, *Foster 1145* (DUKE, PMA). Cerro Jefe, *Foster & Kennedy 1831* (DUKE, PMA), *1841* (PMA). 5–6 mi N of El Llano, 1300 ft, *Gentry 5818* (MO); *Luteyn & Wilbur 4661* (DUKE, PMA); *Mori & Kallunki 2893* (MO). 5–10 km NE of Altos de Pacora, *Mori et al. 4206, 4970* (both MO). El Llano-Cartí Road 12 km N of Panamerican Highway, *Nee 10464* (MO). SAN BLAS: Permé, *Cooper 255* (US). VERAGUAS: Valley of Río Dos Bocas between Agricola Alto Piedra and Calovebora, *Croat 27590* (MO).

4. **Tovomita weddelliana** Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 277. 1860. TYPE: Bolivia, *Weddell 1851* (P, not seen; MO, photo).—FIG. 10.

Clusia oblanceolata Rusby, Desc. S. Amer. Pl. 58. 1920. TYPE: Colombia, *Smith 1880* (MO).

Tovomita longicuneata Engl., Bot. Jahrb. 58. Beibl. 130: 7. 1923. TYPE: Peru, *Weberbauer 3446* (B, not seen; MO, photo).

T. sphenophylla Diels, Notizbl. Bot. Gart. Berlin-Dahlem 14: 32. 1938. TYPE: Ecuador, *Schultze-Rhonoff 1984*, not seen.

T. lanceolata Cuatr., An. Inst. Biol. Univ. Nac. México 20: 102. 1949. TYPE: Colombia, *Cuatrecasas 21278* (US).

T. ligulata Cuatr., An. Inst. Biol. Univ. Nac. México 20: 99. 1949. TYPE: Colombia, *Cuatrecasas 14949* (US).

T. rhizophoroides Cuatr., An. Inst. Biol. Univ. Nac. México 20: 101. 1949. TYPE: Colombia, *Cuatrecasas 14280* (US).

T. glossophylla Cuatr., Revista Acad. Colomb. Ci. Exact. 8: 62. 1950. TYPE: Colombia, *Cuatrecasas 9194* (US).

Clusia pithecobia Standley & L. O. Williams, Ceiba 1: 244. 1951. TYPE: Costa Rica, *Allen 5592* (F, not seen).

Tovomita angustata Steyerm., Fieldiana Bot. 88: 399, *fig. 82*. 1952. TYPE: Venezuela, *Steyermark 60475* (US).

T. coriacea Maguire, Phytologia 36: 406. 1977. TYPE: Venezuela, *Steyermark 94884* (NY, holotype, not seen; VEN, isotype).

Shrub or *tree* to 30 m tall, supported by conspicuous stilt roots; twigs often stout with conspicuous leaf scars; sap milky white. *Leaves* oblanceolate to obovate, to 35 cm long and 8 cm wide, apically obtuse or rounded, sometimes short apiculate, basally narrowed into a broad petiolar area, sometimes ultimately truncate or slightly auriculate, the margin callose-thickened, slightly revolute, the costa prominently elevated on both sides, more so beneath, lateral veins obscure

FIGURE 10. *Tovomita weddelliana* Pl. & Tr.—A. Twig with inflorescence emerging from pair of connate bracts (×3/5). [After *Nee & Tyson 10973* (MO).]—B. Fruiting branch (×3/5). [After *Foster 1832* (MO).]

or appearing very numerous, ca. 9 per cm, nearly straight, parallel, appearing unbranched except near the margin, butting into the obscure continuous submarginal vein, the submarginal vein 0.3–0.5 mm from the margin, often drying glaucous above, minutely (under a lens) whitish-striate, beneath reddish brown, minutely (under a lens) white-punctate; petiole wanting or represented by a small

pad against the stem. *Inflorescence* terminal, to 10 cm tall, cymose, ternately branched, many flowered, in bud enveloped completely by a fused narrowly conical spathaceous structure which splits along 2 sides to yield 2 opposite foliaceous, deciduous bracts; peduncles often stout, drying angled, reddish to greenish-brown, the divisions subtended by cucullate, deciduous bracts to 2 mm long. *Flowers* white, globose in bud, the sepals 4, imbricate in 2 opposite pairs, the inner pair slightly larger, rotund, apically cucullate, 11–14 mm long, coriaceous, persistent and altering somewhat in fruit; petals 4–7, membranaceous, drying yellow, rotund, slightly longer than the sepals; stamens numerous in male plants the filaments filiform, free or some inner series sometimes basally fused, the anthers about as narrow as the filaments with 2, 2-locular, linear lobes, ca. 1 mm long, in female plants the filaments broad except at the apex, the anthers narrow, short, perhaps polleniferous; ovary cylindrical, surmounted by 4–6 flat, rotund, padlike stigmas. *Fruit* a clavate drupe, often oblique, 20–40 cm long, crowned by the sessile stigmas, ultimately splitting into 4–6 valves; calyx lobes erect, ca. 10 mm long, obtuse and more pointed than in flower; seeds 4, black, cylindrical, sulcate, ca. 12 mm long, 4 mm wide, enveloped in a fleshy aril, the seed and aril produced into a narrow basal spur.

This species is easily recognized among the Panamanian Guttiferae by its stilt roots and oblanceolate, sessile leaves. The leaves often appear many-nerved, but close examination reveals there are only about 9 per cm. Collectors report the flowers are white with yellow stamens.

Tovomita weddelliana ranges from Venezuela and Bolivia to Costa Rica. Several variants have been recognized as distinct species, but it is not clear whether they are in any way geographically correlated or representative of distinguishable populations. In Panama this tree is conspicuous, occurring mainly in lowland cloud forests and tropical wet forests of the Caribbean drainage area.

COCLÉ: La Mesa above El Valle, *Croat 25422* (MO); *Mori 6611* (MO). COLÓN: Santa Rita Ridge, *Croat 13896* (MO). 10 mi SW of Portobelo, *Liesner 1058* (DUKE, MO). Río Guanche, 3 km upriver from bridge on road to Portobelo, *Mori & Kallunki 5216* (MO). DARIÉN: Cerro Pirre, *Folsom 4304* (MO). PANAMÁ: Cerro Jefe, *Correa & Dressler 721* (MO). Camino a Llano a Cartí, *Correa et al. 1855* (DUKE, MO). Cerro Jefe, *Foster 1832* (DUKE, MO); *Gentry 4877, 6146* (both MO). 19 km above Panamerican Highway on road from El Llano to Cartí-Tupile, 200–500 m, *Kennedy 2516* (MO). Cerro Azul, 600 m, *Lao & Holdridge 31* (DUKE, PMA, MO). Road from El Llano to Cartí-Tupile, 300–500 m, *Liesner 1269* (MO). El Llano-Cartí Road, 17.5 km from Panamerican Highway, *Mori et al. 4567* (MO). El Llano-Cartí Road, 16–18 km from Panamerican Highway, 400–450 m, *Nee & Tyson 10973* (MO). VERAGUAS: Cerro Tute near Santa Fé, 3000 ft, *Allen 4352* (MO). Between Escuela Agricola Alto de Piedra and Río Dos Bocas, 730–770 m, *Croat 25781, 25961, 27492, 27664* (all MO). NW of Santa Fé, 10.8 km from Escuela Agricola Alto de Piedra on road to Calovebora, *Mori 6733* (MO).

12. TOVOMITOPSIS

Tovomitopsis Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 261. 1860. TYPE: *T. paniculata* (Camb.) Pl. & Tr.

Bertolonia Spreng., Neue Entdeck. 2: 110. 1820, non Spin (1809) nom. rejic., nec Raddi (1820) nom. cons.

Chrysochlamys Poepp. & Endl., Nov. Gen. & Sp. 3: 13, *t. 211*. TYPE: *C. multiflora* Poepp. & Endl., Nov. Gen. & Sp. 3: 13, *t. 211*. ≡*Tovomitopsis multiflora* (Poepp. & Endl.) D'Arcy, comb. nov.

Dioecious or perfect *trees* or *shrubs*, stems terete or angled, trunks sometimes

buttressed, sap often milky white or yellow. *Leaves* at first opposite, later often alternate, simple, entire, the margin usually narrowly differentiated and minutely revolute; costa prominent, mostly elevated beneath, lateral veins several–many, straight or arcuate, sometimes forming a partial submarginal vein, mostly with intermediate veins and secondary lateral veins, glabrate, the costa and major veins sometimes minutely puberulent, secretory canals often forming linear streaks on the leaf undersides; petioles mostly slightly canaliculate; stipules wanting; axillary buds not prominent. *Inflorescences* mostly terminal, sometimes becoming axillary or lateral on the stem, occasionally terminal on short shoots, erect or lax cymose panicles, rarely reduced to 1–3 flowers, the axis mostly unbranched, the nodes branching dichotomously, ternately or in verticels, subtended by foliaceous or reduced scalelike bracts, the pedicels bracteolate, the bracteoles mostly paired, small. *Flowers* monoecious or perfect, the buds mostly globose, the outer perianth imbricate, shorter than the bud or overtopping it, sepals mostly 4–6, rotund, the innermost overtopping the bud, often coriaceous, streaked with canals; petals 4–6, imbricate, mostly overtopping the bud, rotund, often fleshy, streaked with canals; stamens numerous, 25–200, some reduced, fewer or reduced in pistillate flowers, the filaments free or the innermost fused and their anthers reduced or abortive, sometimes crumpled in bud, the anthers 2-lobed, 4-locular, minute, bordering the apex of the filament (connective); ovary ovate, glabrous, surmounted by mostly sessile, discoid styles, reduced or obsolete in staminate flowers. *Fruit* a leathery or fleshy drupaceous capsule splitting from the apex into (4–)5(–6) valves; seeds 1–5, oblong or faboid, basally fixed, enveloped at least in part by a loose, fleshy aril or arilloid.

Tovomitopsis is a genus of several dozen species of tropical America. It may be confused with *Tovomita* or *Dystovomita*, but it differs from the first of these in having the perianth completely free and mostly imbricate, and from the second in having the ovules basifixed and ascending instead of pendulous. For routine recognition, *Dystovomita* differs from *Tovomitopsis* in having the inflorescence cauliflorous on mature wood and in sometimes having part of the perianth basally connate.

Chrysochlamys has traditionally been separated from *Tovomitopsis* on the number of perianth parts and on the androecium of a few species. In *Chrysochlamys* the perianth consists of 5 sepals and 5 petals, but this is also the case in a number of species of *Tovomitopsis*. It is not always clear which members are sepals and which are petals. The androecium of *Tovomitopsis paniculata*, the type of *Chrysochlamys*, and of the closely-related *C. pavonii*, *C. laxa*, and *C. dependens*, have the stamens united into a column while other species which have been traditionally placed in *Chrysochlamys* have androecia as in *Tovomitopsis*. Vasconcellos et al. (1972) reported that pollen in *C. dependens* is porate, but they did not report on any species then considered to belong to *Tovomitopsis*. The pollen of *Tovomita brasiliensis* they found to be colporate.

Species of *Tovomitopsis* occurring in Panama are often difficult to separate, and obvious differences are not always easy to relate in words or in a key. At the same time, in a number of cases, although the number of collections is large, those with good flowers, buds or mature fruits are few, and it has not been possible to make satisfactory comparison with species of South America.

a. Leaves basally truncate, subsessile; flower buds becoming 5–6 mm long and conspicuously striate ---------- 4. *T. croatii*
aa. Leaves basally narrowed, obtuse or acute, petiolate; flower buds not evidently striate or, if so, then less than 4 mm long.
b. Leaves narrow, lanceolate or elliptical, more than 4 times longer than broad.
c. Flower buds more than 5 mm long.
d. Leaves lanceolate, mostly less than 1.5 cm wide; flower buds reddish ---------- 2. *T. angustifolia*
dd. Leaves broader, mostly more than 1.5 cm wide; flower buds drying brown, tan or white, occasionally pinkish or streaked.
e. Leaves coriaceous, drying noticeably revolute (more than 2 mm of leaf margin curved).
f. Leaves drying with conspicuous, numerous canals beneath; outer sepals as long as the bud; inflorescence glabrous ---------- 9. *T. membrillensis*
ff. Leaves drying without conspicuous canals; outer sepals only ¼ as long as the bud; inflorescence minutely puberulent ---------- 3. *T. centistaminibus*
ee. Leaves membranous or chartaceous, hardly revolute (less than 0.5 mm of leaf margin curved).
g. Leaves with 16–20 veins on each side, prominent beneath ---------- 7. *T. membranacea*
gg. Leaves with fewer than 12 veins on each side, mostly obscure ---------- 6. *T. glauca*
cc. Flower buds less than 5 mm long.
h. Leaves with 5–11 veins on each side, sometimes glaucous beneath; buds evidently streaked ---------- 6. *T. glauca*
hh. Leaves with ca. 16 veins on each side, not glaucous; buds not evidently streaked ---------- 10. *T. micrantha*
bb. Leaves broader, mostly less than 4 times longer than wide.
i. Flowers solitary (?or in reduced inflorescences); pedicels (in young fruit) 4 mm long, slender; leaves mostly less than 6 cm long, the veins close, 5–7 per cm ---------- 8. *T. membranifolia*
ii. Flowers in many-flowered inflorescences; pedicels mostly more than 4 mm long, often stout; leaves mostly more than 6 cm long, the veins more widely spaced.
j. Corolla with streaks visible with the naked eye; stamens fewer than 40.
k. Outer sepals almost as long as the flower bud; inflorescence minutely puberulent ---------- 5. *T. faucis*
kk. Outer sepals less than half as long as the flower bud; inflorescence glabrous ---------- 6. *T. glauca*
jj. Corolla streaks not visible with the naked eye; stamens various in number.
l. Stamens more than 50.
m. Leaves with fewer than 11 veins on each side.
n. Upland species (over 1,500 m); flower buds 3–4 mm long; inflorescence branches drying wrinkled and appearing pulverulent ---------- 1. *T. allenii*
nn. Lowlands species (below 1,000 m); flower buds 6–7 mm long; inflorescence branches drying smooth ---------- 11. *T. myrcioides*
mm. Leaves with fewer than 11 veins on each side.
o. Leaves coriaceous, less than 4.5 cm wide; fruiting pedicels slender, 9 mm long ---------- 3. *T. centistaminibus*
oo. Leaves chartaceous, more than 4.5 cm wide; fruiting pedicels stout, 5–7 mm long ---------- 13. *T. standleyana*
ll. Stamens fewer than 50.
p. Inflorescence minutely puberulent.
q. Outer sepals almost as long as the flower bud -- 5. *T. faucis*
qq. Outer sepals less than ½ as long as the flower bud.
r. Leaves membranaceous or chartaceous, mostly drying green (grayish) beneath; sepals drying whitish or pinkish; inflorescence glabrate ---- 6. *T. glauca*
rr. Leaves coriaceous, mostly drying brown beneath;

sepals drying brown; inflorescence minutely puberulent ---------- 12. *T. nicaraguensis*

pp. Inflorescence glabrous.

s. Leaves narrowly ovate or elliptical with fewer than 12 veins on each side, coriaceous, more than 9 cm long ---------- 9. *T. membrillensis*

ss. Leaves elliptical or ovate with more than 12 veins on each side, chartaceous, less than 6 cm long ---------- 7. *T. membranacea*

1. **Tovomitopsis allenii** Maguire, Phytologia 38: 214. 1978. TYPE: Panama, *Allen 5014* (MO, holotype).

Tree to 25 m; twigs stout, drying irregularly sulcate often with a granular, yellowish appearance, sometimes compressed; sap reddish. *Leaves* obovate or elliptical, sometimes narrow, to 20 cm long, 7 cm wide, apically acuminate, basally obtuse or cuneate, the costa glabrous, subplane above, conspicuously rounded, raised beneath, lateral veins 12–15 on each side, evenly spaced and arcuate, loop connected distally and forming a submarginal vein, evanescent and not connected basally, slightly elevated on both sides, inconspicuous above, the minor venation inconspicuous, of intermediate lateral veins running halfway to the margin and numerous secondary lateral veins which interconnect in the marginal ¼ of the leaf; petioles stout, 5–20 mm long, canaliculate above, minutely puberulent. *Inflorescences* terminal or becoming axillary, globose or pyramidal, to 15 cm tall, 12 cm wide, rachis and pedicels minutely puberulent, stout, drying yellowish with a granular appearance, the cymose panicle with the main rachis having ca. 3 nodes, each subtended by foliaceous bracts; pedicels 3–8 mm long, becoming stouter but not much longer in fruit; bracteoles patent, 1–2 mm long, slightly larger in fruit. *Flower* buds globose, ca. 5 mm long, sepals 4, rotund, coriaceous, the outer pair short, less than ¼ as long as the bud, the inner sepals imbricate, one as long as the bud, the other (inner) sepal overtopping it; petals 5 (Maguire), almost twice as long as the sepals, ca. 8 mm long; staminodes numerous (79), the filaments slender, varying in length, to 8 mm long, the anthers minute, parallel or convergent, minutely apiculate, the innermost filaments basally connate, polleniferous; ovary truncate, the 5 carpels apically forming a rim around a central depression. *Fruits* (immature) obpyriform, ca. 14 mm long, the styles conspicuous, short-stipitate, dark; seed ca. 8 mm long, 6 mm wide, ellipsoidal, affixed just above the base, axile, erect, completely but loosely enveloped by an aril, a slightly raised disc present at the chalaza.

This species is closely related to *Tovomitopsis myrcioides* (Pl. & Tr.) D'Arcy, but it differs in the texture of the dried surface of the inflorescence branches and in having generally smaller leaves with more closely spaced veins. It also differs in range, occurring at elevations about 1,000 m above that of *T. myrcioides* in Panama. It occurs also in Nicaragua (*Williams et al. 42981* [US]) and Costa Rica.

The above description differs from that by Maguire in noting larger inflorescences. The unequal, scarious margined outer sepals referred to by Maguire were not confirmed. Maguire described the pollen as spheroidal, tricolporate, 25 μm in diameter and foveolate.

BOCAS DEL TORO: Robalo Trail, N slopes of Cerro Horqueta, 6000–7000 ft, *Allen 5014* (MO, NY).

CHIRIQUÍ: Upper Río Chiriqui Viejo 2 km NE of Guadeloupe, 2 km N of Cerro Punta, *Wilbur et al. 15331* (DUKE).

2. **Tovomitopsis angustifolia** Maguire, Phytologia 36: 399. 1977. TYPE: Panama, *Mori & Kallunki 5357* (MO).

Much-branched *shrub* to 2 m tall, forming salicoid clumps; sap milky. *Leaves* narrowly elliptic, to 10 cm long, 2 cm wide, apically acute or acuminate, callose tipped, basally acute, narrowed into the petiole, the margin minutely revolute, bordered by a narrow indurate line, the costa prominent, prominulous above, conspicuously elevated and drying reddish brown beneath, the lateral veins obscure, 5–6 on each side, strongly ascending, often with one minor intermediate vein, a few short minor veins pinnate on the lateral veins, not forming a distinct submarginal vein; petiole short, ca. 8 mm long, to 2 mm wide, slightly channeled above, striate and sometimes minutely sharp-angled beneath. *Inflorescences* short, sparingly branched, cymose panicles to ca. 6 cm long, basal bracts foliaceous, other bracts narrow, cucullate, 1–2 mm long; pedicels to 10 mm long, longer and stouter in fruit, bibracteolate near the base. *Flower* buds drying pinkish or reddish, ellipsoidal or globose, ca. 9 mm long, 8 mm wide; sepals coriaceous, outer sepals opposite, free, one overlapping in bud but by anthesis shorter than the bud and sometimes spreading, the margins thinned, inner sepals imbricate, the margins narrowly thinned, by anthesis slightly shorter than the bud, inconspicuously striate; petals 7, imbricate, overtopping the bud, thinner than the sepals, inconspicuously nerved; stamens numerous (30–40), free, the filaments broader than the anthers, narrowing upwards, slightly differentiated below the anthers, anthers slightly converging upwards, the connectives minutely apiculate, unequal, the inner longer. *Fruit* pyriform, 1.5–2.0 cm long, 10–12 mm wide, the body rounded-sulcate, sometimes slightly flattopped, drying pink or red, the styles forming a short apiculus, the stigmas sometimes persistent, basally narrowed into an obconical stipe; seed oblong, basifixed, with a discolorous, almost apical chalazal disc, the hilum conspicuous, a loose dorsally venose aril fixed at the base and loosely enveloping the seed.

This is one of the most distinctive species in the Panamanian Guttiferae flora having a salicoid growth form, being shrubby with narrow leaves and occurring along streams. In this respect it parallels *Solanum intermedium*, common in similar habitats in lowland Darien Province. *Tovomitopsis angustifolia* is known only from the area around Santa Fé in Veraguas Province.

This species displays characters of both *Tovomita* and *Tovomitopsis*: the venose aril of the former and the incomplete, imbricate sepal prefloration of the latter. Maguire's placement of the species in *Tovomitopsis* in accepted here: the outer perianth parts seem to conform more to *Tovomitopsis* than to *Tovomita*.

VERAGUAS: Río Pimero Braso, 2.5 km beyond agricultural school Alto Piedra near Santa Fé, 700–750 m, *Croat 25437* (MO). Between Alto Piedra school and Río Calovebora 1.8 mi beyond school, 500 m, *Croat & Folsom 34120* (MO). First branch of Río Santa Maria on road to Calovebora from Santa Fé, *Mori & Bolten 7642* (MO). Río Dos Bocas, 11 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 3179* (MO). Road to Calovebora, 2.7 km from Escuela Agricola Alto de Piedra, *Mori & Kallunki 5357* (MO). Road to Calovebora, 16 km NW of Santa Fé, 300–500 m, *Mori & Kallunki 6125* (MO).

3. **Tovomitopsis centistaminibus** D'Arcy.[11] TYPE: Panama, *Little 6070* (MO, holotype; US, isotype).

?Dioecious *tree* to 20 m tall, new growth drying dark reddish brown, minutely puberulent, older twigs gray. *Leaves* coriaceous, ovate, obovate or elliptical, to 15 cm long, 5 cm wide, apically acuminate or acute, basally acute, the margins minutely revolute, the narrow, indurate border drying reddish, the costa nearly plane above, elevated and drying reddish brown beneath, the lateral veins 6–10, obscure above, evident beneath, parallel, sometimes ill spaced, ascending and arcuate at the margin, not forming a submarginal vein, the minor venation obscure above and beneath, not well developed, consisting of a few intermediate lateral veins and pinnae on the lateral veins, drying discolorous, above slate gray, beneath yellowish green, canals not evident; petiole slender, 15–20 mm long. *Inflorescence* terminal, soon on a lateral leafy short shoot, ca. 10 cm long, rounded or pyramidal, the primary axis somewhat stout, the axes minutely puberulent; bracts cucullate, ca. 3 mm long, spreading, ?minutely puberulent, drying reddish; bracteoles minute, rounded or blunt, puberulent; pedicels short, 1–3 mm long. *Flower* buds globose, 3–4 mm long, the basal pair of sepals often wide spreading, inner sepals 3, imbricate, overtopping the bud, drying unlined or with light-colored veins, petals 3–4, imbricate, overtopping the bud, thick, sometimes with few fine lines; in male flowers the stamens numerous (90), free, clustered, the longer filaments crumpled in bud, anthers variable in shape and size, some perhaps abortive, the locules lateral at the connective apex, the connective sometimes slightly extended; ovary rudimentary consisting of 5 short, digitate, imperfect carpels. *Fruit* ca. 20 mm long, globose to pyriform, seed with an orange aril.

This species has distinctive subcoriaceous small, elliptical leaves which dry with the venation beneath obscure or somewhat reddish. It is similar to *T. psychotraefolia* Oerst. of Costa Rica, which differs in having conspicuously maculate sepals and petals and larger leaves. *Tovomitopsis centistaminibus* is known from Panama, Colombia (Cauca: Entre Aguabonita y Candelaria, 2,280–2,350 m, *Cuatrecasas 23563* (US). Meta: 6 km N of Hacienda El Pato, 7,600 ft, *Little 8021* (US). Valle: Piedra de Moler, 900–1,180 m, *Cuatrecasas 15052* (US). Without Other Locality: *Mutis 1069* (US)) and Ecuador (Santiago-Zamora: Between Pailas and El Pan, 2,255–3,445 m, *Steyermark 54307* (US)). Panamanian collections are all from upland Chiriqui.

CHIRIQUÍ: 8 km N of Camp El Volcán, 6000 ft, *Little 6046, 6068* (both MO), *6070* (MO, US). N of San Félix on Cerro Colorado copper mine road along continental divide, 5000–5500 ft, *Mori & Kallunki 5970* (MO).

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[11] *Tovomitopsis centistaminibus* D'Arcy, spec. nov. *Arbor* ad 20 m alta. *Folia* elliptica, coriacea discolora, venis subtus rubescentibus in sicco, supra obscuris, venis minoribus obscuris, venis lateralis utraque 6–10, vena submarginale carenti. *Inflorescentia* bracteolis minute pubescentibus, pedicellis 1–3 mm longis. *Alabastra* globosa 3–4 mm longa, sepalis basalis brevis aliquantum patentibus, staminibus numerosis, circa 95, libris, filamentis longioribus corrugatis. *Fructus* 20 mm longus, globosus ad pyriformis, semine arillo aurantiaco tecto.

4. **Tovomitopsis croatii** (Maguire) D'Arcy, comb. nov.

Tovomita croatii Maguire, Phytologia 36: 404. 1977. TYPE: Panama, *Croat 14268A* (MO).

Shrub to 2 m tall, branches terete. *Leaves* elliptic or obovate, to 25 cm long, 10 cm wide, apically acuminate, basally narrowed, rounded, ultimately truncate or auriculate, the margin with an indurate border 0.25 mm wide, chartaceous; costa and lateral nerves conspicuous, subplane above, elevated and drying brown beneath, the lateral veins numerous, ca. 18 on each side, slightly curved and slightly ascending, parallel and evenly spaced, anastomosing at the margin to form a looping submarginal vein, minor venation obscure consisting of weak intermediate nerves and of cross veins between the lateral nerves, drying above and beneath with a dense sometimes conspicuous array of wavy, linear canals, these somewhat contrasting beneath; petioles to 5 mm long or wanting, often forming a nodal mark or ridge. *Inflorescence* an open cymose panicle, to 12 cm long, drying reddish brown; bracts conspicuous, smaller and narrower upwards, keeled and clasping the inflorescence branch, apically narrowed; pedicels 5–8 mm long, sometimes minutely puberulent, stouter above the bracteoles; bracteoles ca. 4 mm long. *Flower* buds globose or ellipsoid, to 7 mm long, mostly conspicuously striate; outer sepals overlapping the bud, imbricate, the sepals 5; petals 5, all overtopping the bud, conspicuously maculate, especially basally, with a small stipe and large claw; in staminate flowers the stamens numerous (30–40), the anthers minute, convergent at 45°, the filaments free, slightly bent or crumpled in bud; ovary obsolete. *Fruit* not seen.

This species is distinctive in its sessile, basally clasping or auriculate leaves. The leaves and inflorescence dry reddish brown, and the large buds are maculate. Maguire placed this species in *Tovomita*, which may be correct, but the outer perianth is composed of completely free parts which are imbricate at the top of the bud. Because pistillate flowers or fruit have not been found, it is not possible to examine details of the ovule.

Tovomitopsis croatii is known from separated points in western Panama. It is not known from outside of Panama.

BOCAS DEL TORO: Between Quebrada Gutierrez and E slope of La Zorra, headwaters of Río Mal on Chiriqui Trail, *Kirkbride & Duke 732* (MO). COCLÉ: El Valle, *Croat 14268A* (MO). Cerro Pilón, *Dwyer et al. 4556* (MO). Cerro Caracoral, *Kirkbride 1122* (MO). NW of Santa Fé 0.8 km from Escuela Agricola Alto Piedra, on road to Calovebora, *Mori 6725* (MO).

5. **Tovomitopsis faucis** D'Arcy.[12] TYPE: Panama, *Pittier 3039* (US).

?*Tree*, twigs at first strongly angled and sulcate, soon terete, the new growth drying olive green, slightly older growth drying yellowish green, hollow, the nodes 1.5–3.0 cm apart. *Leaves* elliptical or obovate, 10–20 cm long, 4–7 cm wide,

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[12] *Tovomitopsis faucis* D'Arcy, spec. nov. Species venis ad initium minute puberulentibus mox glabris ca. 11 utraque arcuatis ascendentibus, venam submarginale carens, alabastro roseo 5 mm longo maculato, staminibus numerosis circa 28 libris.

apically obtuse, short acuminate, basally obtuse, acute or acuminate, the margin narrowly stramineous, drying minutely revolute and thus concealed except at the apex, the costa elevated beneath, the lateral veins ca. 11 on each side, slightly arcuate and ascending, abruptly ascending at the margin, the apical veins anastomosing near the margin, not forming a submarginal vein, one or more lateral veins divided well in from the margin, the minor venation obscure above, of ill-spaced, unequal intermediate veins (0–)5–6 weak, irregular pinnate veins arising from the laterals and sometimes anastomosing in the intervenal region, ptyxis at least in part involute, the costa and bases of the lateral veins minutely puberulent beneath on emerging, soon glabrous, surface canals not evident; petioles 15–20 mm long, slightly expanded at the base, minutely puberulent dorsally. *Inflorescences* terminal on leafy shoots, a cymose raceme or panicle ca. 8 cm long, the axis drying green, the branches subtended by minute scale bracteoles; pedicels ca. 5 mm long. *Flowers* with the buds ovoid, ca. 6 mm long; sepals petaloid, hardly striate, overtopping the bud, imbricate, membranous; petals 4–5, overtopping the bud; stamens ca. 24, some filaments slightly connate basally, ca. 2 mm long; ovary wanting in staminate flowers, pistillate flowers not seen. *Fruit* not seen.

This species is distinct in its venation pattern and in the size of its flower buds. It appears to be related to *Tovomitopsis glauca,* but the striation of the pinkish petals is only slightly evident. This species is known only from the type, which is staminate. It is named for the type locality, El Boquete, meaning a defile or gorge.

CHIRIQUÍ: Flower white, along river, forests around El Boquete, 1000–1300 m, 5 March 1911, *Pittier 3039* (US).

6. **Tovomitopsis glauca** Oerst. ex Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 264. 1860. TYPE: Costa Rica, Mt. Jaris, *Oerstedt 3* (=*Oerstedt 3589*), (?P, not seen; C, not seen; MO, photo).—FIG. 11A–B.

?*Tovomita martiana* Engler in Mart., Fl. Bras. 12(1): 453. 1888. TYPE: Brasil, *Martius* (M, not seen; MO, photo).

T. multiflora Standley, Field Mus. Nat. Hist. Bot. Ser. 4: 234. 1929. TYPE: Panama, *Cooper & Slater 171* (US).

T. glauca (Oerst. ex Pl. & Tr.) L. O. Williams, Fieldiana Bot. 29: 357. 1961.

Shrub or *tree* to 8 m tall, twigs at first deeply sulcate, soon terete, drying greenish or grayish, glabrous, internodes variable, 5–25 mm apart. *Leaves* ovate or elliptical, sometimes narrow, sometimes oblique, mostly 5–10 cm long, (1–)3–5 cm wide, apically acuminate, the tip often curved, basally obtuse or acute, glabrous, minutely revolute; costa plane above, sharply elevated beneath, the lateral veins 5–11, obscure, arcuate and ascending, evenly spaced, recurving and anastomosing in broadly crenate fashion near the margin, the looping outer connected vein giving rise to minor, peripheral loops, a submarginal vein not formed, minor venation mostly obscure, mostly of about 2, ill-spaced intermediate veins which arise at irregular angles, and short, ill-spaced veins pinnate on the lateral veins, the lower surface with inconspicuous surface canals evenly dispersed in the intervenal areas, ascending slightly more than the lateral veins, often gray-

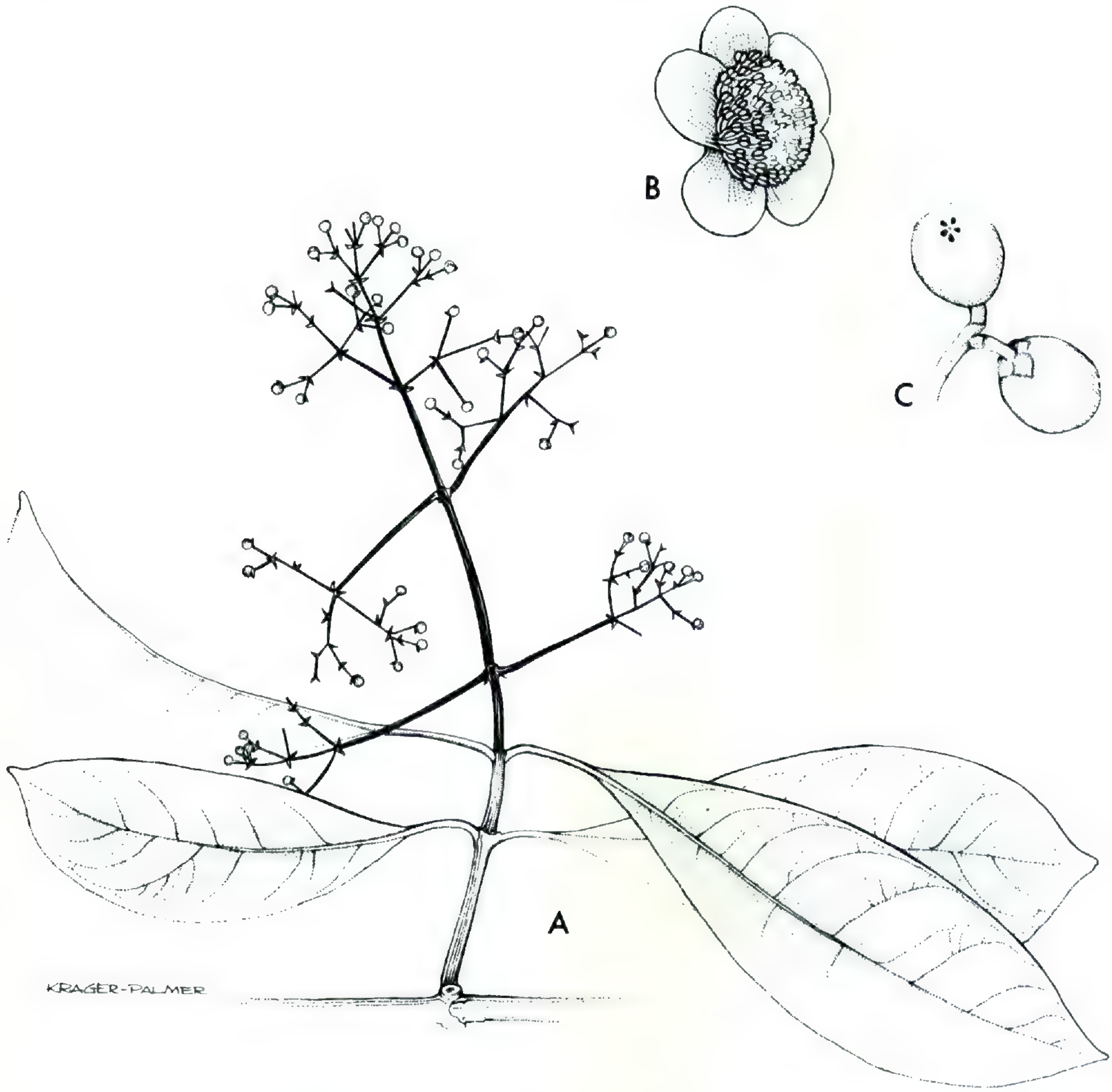

FIGURE 11. *Tovomitopsis*.—A.–B. *T. glauca* Oerst.—A. Flowering twig (×½). [After *Kirkbride & Duke 560* (MO).]—B. Flower (×2½). [After *Smith 162* (MO), Costa Rica.]—C. *T. nicaraguensis* Pl. & Tr. Fruit (×2½). [After *Croat 8647* (MO) and photo of same.]

green or glaucous beneath; petioles 6–25 mm long, narrow, canaliculate above, the narrow margins forming sharp angles. *Inflorescences* terminal, sometimes becoming axillary, sometimes on leafy short shoots, subtended by normal leaves, a pyramidal hemispherical or cylindrical cymose panicle, the peduncle 5–12 cm long, 3–6-noded, the primary axis stout or slender, compressed above, the branches mostly slender, pedicels 4–6 mm long, becoming 10–12 mm long and stouter in fruit, often bibracteolate in the lower half, sometimes minutely puberulent. Staminate *flowers* with the buds often pinkish, 3–5 mm long, conspicuously striate, ovoid or ellipsoidal; outer sepals opposite, ca. 2 mm long, much shorter than half the length of the bud, striate, sometimes pink at the base, the inner 3(–4) sepals imbricate, overtopping the bud, membranous, striate, ca. 5 mm long; petals 4–5, about as long as the inner sepals, thicker, striate, overtopping the bud, imbricate. In staminate flowers the stamens numerous (28–33), the filaments

ca. 0.5 mm wide, free or the innermost slightly connate basally, the inner stamens slightly longer and broader with flat filaments, some rudimentary anthers perhaps not polleniferous; ovary obtuse, longitudinally sulcate, the styles relatively large, 5, subsessile, flattopped, heel shaped, contrasting in color, ?yellowish or orange; pistillate flowers with buds slightly larger, the outer sepals relatively slightly longer; stamens as in male flowers but the thecae reduced; ovary about as long as the stamens, the stigmas 5, subsessile, spreading. *Fruit* pyriform, 20–25 mm long, sulcate, slightly depressed apically, often strongly asymmetrical or curved by abortion of 1 or more locules, the styles conspicuous or not, subsessile, drying reddish brown; seeds oblong, basifixed, erect, the testa slightly venose, completely enveloped by a basifixed, unveined aril.

Tovomitopsis glauca is extremely variable in leaf and flower bud size but is recognizable by its leaves with few inconspicuous veins and striately maculate flower buds. There is also great variation in inflorescence, this ranging from a short, almost congested cymose panicle to a 30 cm long, open, pendulous panicle with slender, elongate, weak inflorescence branches. Collections of this species from two localities in central Panama, Río Guanche on the Caribbean coast and Cerro Campana near the Atlantic, have smaller stature and smaller narrower leaves than usual and are suggestive of a distinct variety or even species. But in each case other specimens show this variation to be continuous with wider-leaved, more normal morphology. This narrow-leaved form is similar to *T. angustifolia*, which occurs in the same area. The flower buds are very different in the two species.

BOCAS DEL TORO: Duwebdulup Peak N of Río Teribe across from Quebrada Huron, 90–270 m, *Kirkbride & Duke 560* (MO). Chiriquicito-Calderas trail between Quebrada Higueron and Guttierrez, *Kirkbride & Duke 765* (MO). CANAL ZONE: Slope N of Indio Tower, NW part of Canal Zone, *Johnston 1794* (MO). Drowned forest of Río Boqueron and Peluca Hydrographic Station, *Steyermark & Allen 17269* (US). CHIRIQUÍ: Progreso, *Cooper & Slater 171, 274, 304* (all US). 10–11 mi W of Puerto Armuelles, 300–500 m, *Croat 21995* (MO). Paseo Canoas to Cañas Gordas, *Croat 22211, 22348* (both MO). 8 mi W of Puerto Armuelles, 200 m, *Croat 22472* (MO). 19 km W of Río Chiriqui Viejo on road to San Serano, 1000–2000 m, *D'Arcy 10835* (MO). Near Pinola, *Kirkbride & Duke 865* (MO). 1 mi E of Cañas Gordas near Costa Rican Border, *Liesner 268* (MO). Near Las Lagunas W of El Hato del Volcán, 1400 m, *Wilbur et al. 11001* (DUKE). COCLÉ: Between Cerro Pilón and El Valle de Antón, 700–900 m, *Duke & Dwyer 13936* (MO, NY, SCZ). Base of Cerro Pilón above El Valle, *Gentry & Dwyer 3654* (MO). La Mesa, El Valle, 1000 m, *Gentry 6848* (MO). N of El Valle de Antón, 2500–3000 ft, *Lewis et al. 1769, 1785* (both MO). Cerro Pilón, 800–1045 m, *Mori 6565* (MO). 3 km NE of El Valle, *Mori & Kallunki 2960* (MO). COLÓN: Santa Rita Ridge, *Dwyer 8564* (MO). Río Guanche, *Foster & Vocelka 2201* (DUKE); *Foster et al. 2330* (DUKE); *Gentry 8764* (MO); *Kennedy 1174* (DUKE, MO); *Kennedy & Foster 2132* (MO); *Mori et al. 6443* (MO); *Mori & Kallunki 5194, 5212* (both MO); *Mori & Witherspoon 7955* (MO); *Nee & Gentry 8719* (MO). DARIÉN: Río Yape, *Bristan 1378* (MO, US). Between Paya and Palo de las Letras, *Duke & Kirkbride 14024* (MO, SCZ). Cerro Campanento S of Cerro Pirre, *Duke 15646* (US). PANAMÁ: Cerro Trinidad, 800–1000 m, *Allen 3773* (MO). El Llano-Cartí road, *Busey 3777* (MO). Cerro Campana, *Croat 14681, 14753* (both MO). El Llano-Cartí road, *Nee & Dressler 9371* (MO). Cerro Campana, *Porter et al. 4259* (MO, DUKE). VERAGUAS: Between Escuela Agricola Alto Piedra and Calovébora, *Croat 27665* (MO); *Mori & Kallunki 3224, 3950* (both MO).

7. **Tovomitopsis membranacea** (Pl. & Tr.) D'Arcy, comb. nov.

Chrysochlamys membranacea Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 260. 1860. TYPE: Colombia, *Triana* (P, not seen; MO, photo).

Tree to 6 m tall. *Leaves* membranous or chartaceous, obovate, to 25 cm long,

to 7 cm wide, apically acuminate, basally obtuse or acute, sometimes falcate, the costa narrowly and sharply elevated beneath, subplane above, the lateral veins numerous, 17–20 on each side, nearly straight, ascending, branching near the margin and loop connected but not forming a submarginal vein, slightly further spaced near the apex, chartaceous or membranous, drying beneath with conspicuous, numerous canals parallel to the lateral veins, the costa and lateral veins minutely puberulent near the base; petiole almost wanting or to 25 mm long, minutely puberulent beneath. *Inflorescence* an open, ?pendulous panicle, the axes elongate, lax, minutely puberulent, the pedicels ca. 6 mm long, becoming 15–20 mm long in fruit. *Flowers* (after Vesque, 1893) ca. 15 mm across, calycine bracts (outer sepals) lacking, sepals 5, quincuncial, orbicular, the outermost smaller; petals 5, apparently alternating with the sepals, obovate, contracted into a broad limb; stamens to 20, indistinctly 2-seriate, free, the filaments linear, compressed, the anthers small, the connective bordered by the two basally diverging, laterally and introrsely dehiscent anther locules, the staminodes forming a solid column in the center; pistillate flowers (after Planchon & Triana) with the stamens few or none, the staminodial annulus shielding the ovary; ovary short, stout, surmounted by 5 thick stigmas. *Fruit* obovoid to pyriform, 25–30 mm long, pale green tinged with red (*Croat 34216*), the styles forming a small apiculum, the base with 3–4 persistent, coriaceous, minute sepals.

This species is distinct in its papery leaves with numerous straight, ascending veins. The pendulous clusters of fruits are also distinctive in appearance. The material at hand is doubtfully identified with the Colombian material on which the name *T. membranacea* is named. The leaf venation and shape is quite similar and the original authors refer to the minute puberulence of the nerves. In Panama the species is known only by one collection and accompanying photograph taken in a region of lowland cloud forest in central Panama.

VERAGUAS: Above Santa Fé beyond Escuela Agricola Interamericana 1.8 mi beyond road fork on Pacific slope and on side of Cerro Tute, *Croat 34216* (MO).

8. **Tovomitopsis membranifolia** (Standley) D'Arcy, comb. nov.

Tovomita membranifolia Standley, Field Mus. Nat. Hist. Bot. Ser. 22: 160. 1940. TYPE: Panama, *Terry & Terry 1478* (F, holotype, not seen; MO, isotype).

Glabrous *shrub* or *tree* to 4 m tall, branches slender, solid. *Leaves* elliptical, to 10 cm long, 3.5 cm wide, apically acuminate, basally obtuse; venation more or less obscure above, the costa slightly elevated proximally beneath, the lateral veins numerous, 16–26 on each side, mostly straight and ascending, branching near the margin and forming a distinct but discontinuous submarginal vein 0.5–1.5 mm from the margin, minor venation of intermediate veins which sometimes rank with the lateral veins, and of a fine reticulum, membranaceous or chartaceous, sometimes drying pinkish or reddish; petioles short, 8–10 mm long. *Inflorescence* (from fruiting material) of a solitary flower terminal between a pair of normal leaves on a short axis; pedicel slender, 3 mm long or becoming longer. *Flowers* unknown. *Fruit* ovoid or elliptical, ca. 20 mm long, subtended by 5 coriaceous rotund, slightly cucullate sepals 2 mm long, the valves drying maroon within.

This species is known only by the type collection and one other cited below, both in fruit. The original description made no mention of flowers or fruiting parts. The type resembles many specimens of *T. glauca,* but the venation pattern is different and the inflorescence reduced to solitary flowers. These two collections may represent depauperate individuals of some other species. The Panamanian material described here is quite similar to the type of *Tovomita krukovii* A. C. Smith[13] of Amazonian Brasil. This species also has reduced inflorescences consisting of only 1–3 small flowers on a short axis. *Tovomita krukovii* is described as having 4 sepals instead of the 5 of *Tovomitopsis membranifolia.*

DARIÉN: Cuasí-Caná trail between Cerro Campamiento and La Escalera to "Paramo" E of Tres Bocas, *Kirkbride & Duke 1312* (MO). Caná-Cuasí Trail, Chepigana District, 4000 ft, *Terry & Terry 1478* (MO).

9. **Tovomitopsis membrillensis** D'Arcy.[14] TYPE: Panama, *Duke 10872* (MO-2124393, holotype).

Small *tree* to 7 m tall, mature twigs terete with numerous longitudinal furrows, young twigs somewhat compressed, finely many-angled, drying lighter. *Leaves* lanceolate or narrowly elliptic, occasionally widest above the middle, mostly 15–20 cm long, 4.5–6.0 cm wide, apically acute or slightly acuminate, minutely callose, basally acute or obtuse, the margins minutely revolute, drying discolorous, slate green above, yellowish or reddish green and lighter beneath, the costa slightly raised and rounded above, elevated and almost excurrent beneath with sharp angles, the lateral veins ca. 9 on each side, obscure above, conspicuous beneath, arcuate, ascending at the margin, not forming a submarginal vein, sometimes with some weak anastomosing connections in the upper portion, 2–3 inconspicuous intermediate veins between pairs of lateral veins and 1–3 similar veins pinnate from the lateral veins, numerous conspicuous ducts evident rising at a slightly sharper angle than the veins; petiole 10–30 mm long, slightly and narrowly canaliculate above, striate beneath, drying dark or reddish brown. *Inflorescences* terminal cymose panicles, appearing axillary in fruit, glabrous, the main axis slender, ca. 7 cm long, bearing ca. 5 pairs of branches each 3–5 cm long, these in turn bearing 1–3 rachises or pedicels, the pedicels 6–15 mm long, slender, stiff, enlarging upwards, drying ridged, in fruit appearing continuous with the penultimate element of the inflorescence, these two parts together to 20 mm long, the pedicel slightly longer; bracts cucullate, the inflorescence subtended by normal leaves, the bracts 2–3(–6) mm long, the bractlets subtending the pedicels ca. 1 mm long, persistent. *Flower* buds ca. 5 mm long, ellipsoidal, the outer sepals mostly equal, as long as the bud or only ½ as long, overlapping, spreading wide, conspicuously ribbed; sepals 5, petals 5, opposite, imbricate and apically hooding the interior of the bud, conspicuously nervate, the innermost sometimes rudi-

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[13] *Tovomita krukovii* A. C. Smith, Phytologia 1: 122. 1935. TYPE: Brasil, Terra Firma, basin of Rio Jurua, *Krukoff 4887* (MO, US).

[14] *Tovomitopsis membrillensis* D'Arcy, spec. nov. *Arbor* ad 7 m alta foliis angustis coreaceis minute revolutis canalibus secretoriis numerosis conspicuosis. *Inflorescentia* paniculata, alabastro bruneo siccante, sepalis exterioribus imbricatis. *Fructus* roseus.

mentary; stamens numerous (37), free, the filaments relatively stout, slightly narrower upwards, the anthers 0.3 mm long, the filaments crumpled in bud, all somewhat bent to one side; ovary rudimentary.

This species is distinct in its narrow, coriaceous leaves with conspicuous canals in the wide areas between lateral veins. The canals are not all parallel but change direction along their length. The buds dry dark brown but the streaks are still visible with the naked eye. *Duke 10901* records the fruits are pink.

Tovomitopsis membrillensis is similar to some Colombian material labeled as *Chrysochlamys ulei* Engler, but these specimens have broader leaves and puberulent inflorescences.

DARIÉN: Upper Río Membrillo near construction road to San Blas, 100–800 m, *Duke 10863, 10872, 10901* (all MO).

10. **Tovomitopsis micrantha** (Engler) D'Arcy, comb. nov.

Chrysochlamys micrantha Engler, Bot. Jahrb. 58, Beibl. 130. 1923. TYPE: Peru, *Weberbauer 4658a* (B, not seen; MO, photo).

Tree or *shrub* to 7 m tall, branches slender. *Leaves* elliptical, to 12 cm long, 4.5 cm wide, apically acuminate, the acumen ca. 10 mm long, basally obtuse, the costa subplane above, only slightly round raised beneath, the lateral veins inconspicuous, ca. 16 on each side, straight, slightly ascending, branching at the margin but not forming a distinct submarginal vein, intermediate veins 2–3 between each pair of lateral veins, these sometimes as prominent as the lateral veins, drying green, glabrous; petiole slender, 6–9 mm long. *Inflorescence* terminal or axillary, cymose, glabrous, short or elongate, the bracts and bracteoles alike, cucullate, spreading, the peduncle and pedicels slender, drying yellowish, 4 mm long, becoming 9–10 mm long in fruit. *Flower* buds globose, 2 mm across, outer sepals ⅓ as long as the bud, inner sepals as long as the bud but not overtopping it, imbricate, unmarked. *Fruit* ca. 15 mm long, red (*Croat 16754*), drying reddish, tipped by 3(?4) persistent dark styles, mostly faboid as a result of abortion, one pair of sepals spreading; only 1 seed maturing, black with a white aril (*Croat 16754*).

This species is distinct in its membranous leaves, which appear to be many-nerved, and in the small flower buds. Because only one flowering Panamanian specimen was available and that with only two buds, the flower was not dissected. Hence, identification of this species with *Chrysochlamys micrantha* is tenuous at best. The specimens at hand have partly aborted fruits and only 3 styles. It is assumed that these specimens are abnormal and that 5 seeds commonly mature and 5 styles are usual in the species. The Panamanian collections have inflorescences no longer than 5 cm long whereas that of the type collection is 9 cm long. *Chrysochlamys tenuifolia* Cuatr.[15] of Colombia may be the same species.

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[15] *Chrysochlamys tenuifolia* Cuatr., Revista Acad. Colomb. Ci. Exact. 29: 59. 1950. TYPE: Colombia, *Cuatrecasas 10880* (US).

DARIÉN: Trail from Cerro Mali to Río Pucuro base camp, Serrania del Darién, *Gentry & Leon 16832* (MO). Río Tacarcuna near old Tacarcuna village, 580 m, *Gentry & Mori 13577, 13586* (both MO). N slope of Cerro Mali on Colombian border, 1400–1500 m, *Gentry & Mori 13806* (MO). SAN BLAS: Forest SE of Puerto Obaldía, *Croat 16754* (MO).

11. **Tovomitopsis myrcioides** (Pl. & Tr.) D'Arcy, comb. nov.

Chrysochlamys myrcioides Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 260. 1860. TYPE: Colombia, *Triana* (P, not seen; US, MO, photo).

Tovomita macrophylla L. O. Williams, Trop. Woods 111: 16. 1959, non Klotzsch ex Schomburgk (1848), nec Walp. (1842). TYPE: Costa Rica, *Allen 2968* (US).

T. grandifolia L. O. Williams, Trop. Woods 112: 96. 1960. New name for *Tovomita macrophylla* Wms., non Klotzsch ex Schomburgk (1848), nec Walp. (1842).

Tree to 15 m tall, twigs robust, drying reddish brown. *Leaves* elliptical, to 25 cm long, 15 cm wide, apically acute, acuminate or obtuse, basally acute or obtuse, the margins minutely revolute, the costa slightly elevated above, rounded-raised beneath and drying striate, lateral nerves numerous, 17–19 on each side, nearly straight, evenly spaced, arcuate at the margin and indistinctly loop-connected, not forming a defined submarginal vein, coriaceous, glabrous, the lesser venation obscure, intermediate veins few, often short, secondary lateral veins ascending, crossing the lamina between the lateral veins; slightly discolorous, darker above, sometimes drying pinkish above; petiole stout, to 5 cm long, slightly channeled above, especially at the base, sometimes minutely puberulent, drying striate. *Inflorescences* terminal, to 15 cm long, cymose pyramidal panicle, the lateral branches to 7 cm long, drying sharply compressed, stout, stouter and broader in fruit; bracts to 8 mm long, rarely subfoliaceous and much longer, rachis minutely puberulent; pedicels sharply compressed, to 7 mm long, 3 mm wide, subtended by pairs of broad bracteoles to 2 mm long. Staminate *flowers* with buds globose, ca. 6–8 mm across, sepals 5–6, coriaceous, the outermost somewhat divaricate, about ½ as long as the bud, rotund, basally imbricate, third sepal nearly overtopping the bud, inner sepals overtopping the bud and enfolding the interior portions; petals 4–5, thick, shorter than the inner sepals, overtopping the bud, the innermost overtopped by some of the stamens, inconspicuously nervate; stamens numerous (129), the filaments free, slender, the outermost shorter, about as wide as the anthers, the thecae apically converging; ovary obsolete. *Fruit* (dried) ovoid or obovoid, 3.5 cm long, ca. 2 cm across, dark red, collapsing and irregularly sulcate, slightly narrowed basally, apically obtuse, the subsessile stigmas 5, persistent, dark, ca. 2 mm long, ca. 2 mm across; perianth persistent, divaricate, the pedicels 10–15 mm long, 5–7 mm thick, the bracteoles persistent, costate, ca. 4 mm long, 3 mm wide; seeds 1–2 per locule, fabiform or ellipsoidal, erect, affixed basally to the carpel septum (axile), enveloped by a large, free basifixed aril, ca. 20 mm long, 3 mm wide, the chalaza discoid, 2 mm across, prominent, the testa ?fleshy, arilloid-like on the basal ⅓ on one side, venose along one side.

This species is characterized by its large coriaceous leaves which sometimes dry pinkish and which have many evenly parallel veins. The fruit with its large, persistent, coriaceous perianth is also distinctive. It is closely related to *T. allenii*, from which it may be only varietally distinct. The type collection of *Tovomita grandifolia* is quite glabrous, but other collections seen are minutely puberulent,

and Planchon and Triana comment that the type collection of *T. myrcioides* is also puberulent. *Tovomitopsis myrcioides* ranges from Costa Rica to Colombia and is known in Panama from lower elevation cloud forests, below 1,300 m.

COCLÉ: Cerro Pilón, *Dwyer 8628* (MO). COLÓN: Santa Rita lumber road ca. 15 km E of Colon, *Dressler 3802* (MO). PANAMÁ: Cerro Campana, *Croat 22840* (MO). Goofy Lake, *Dwyer 8028* (MO). Cerro Campana, *Mori & Bolten 7683* (MO). VERAGUAS: 5 mi W of Santa Fé on road past Escuela Agricola Alto Piedra, 800–1200 m, *Croat 23151* (MO).

12. **Tovomitopsis nicaraguensis** Oerst. ex Pl. & Tr., Ann. Sci. Nat. Bot. Sér. 4. 14: 266. 1860. TYPE: Nicaragua, ad flumen San Juan, *Oersted 2* (C, not seen; MO, photo).—FIG. 11C.

Chrysochlamys eclipes L. O. Williams, Trop. Woods 111: 15. 1959. TYPE: Panama, *Standley 31459* (US).

Tovomita nicaraguensis (Pl. & Tr.) L. O. Williams, Trop. Woods 111: 18. 1959.

Shrub or small *tree* to 11 m tall, glabrate; twigs terete, minutely puberulent, becoming rough and dark gray; sap yellow. *Leaves* obovate, to 25 cm long, 10 cm wide, apically acuminate, the acumen 1–3 cm long, basally acute, subcoriaceous, the costa prominent beneath, subplane above, the lateral veins 8–13 on each side, ascending, straight and ascending near the margin, looping to form an inconspicuous submarginal vein, discolorous, drying slatey with the venation inconspicuous above, greenish or yellowish brown beneath with prominent, reddish brown veins, the minor venation inconspicuous, consisting of short intermediate veins and short secondary pinnate veins; petiole puberulent, 1.5–3.0 cm long, narrowly channeled above. *Inflorescence* terminal or on short shoots, a pyramidal panicle to 15 cm long, the axis, branches and sometimes the bracts minutely puberulent, the branches spreading, subtended by minute, scalelike bracts; pedicels ca. 15 mm long, bibracteolate about ⅓ way along, longer and slightly stouter in fruit. *Flowers* with the buds globose, 2–3 mm across, drying reddish brown, not evidently marked; sepals 5, the outermost as long as the bud or shorter, imbricate, the innermost overtopping the bud, coriaceous, the canals scarcely evident to the naked eye; petals 5, yellow (Croat, 1978), thick, rotund, ca. 4 mm long; stamens numerous (87), the filaments unequal, compressed, some bent, some anthers reduced; gynoecium obsolete; pistillate flowers (Croat, 1978) with ca. 20 stamens; ovary ca. 2 mm long, the stigmas 5, subapical. *Fruit* red, ca. 2 cm long, ovoid, 5-carpellate, the stigmas sessile, deltoid, ca. 1 mm long, the stigmatic rosette ca. 3 mm across; locules 1-ovulate, ultimately separating widely into 5 valves; seeds 5, narrowly faboid, ca. 1 cm long, erect, attached basally (axile), green or black, enveloped in an orange aril which is covered by a white membrane.

Tovomitopsis nicaraguensis is the most common species of the genus in Panama. It may be recognized by its relatively large obovate leaves with strong venation, its minutely puberulent inflorescence, and by the size of the fruit and flower buds. It is similar to *T. myrcioides,* but the leaves, flower buds and fruit are smaller.

This species ranges from Nicaragua to Ecuador and Peru. In Panama it occurs in lowland forests on both sides of the isthmus.

BOCAS DEL TORO: Duwebdulup Peak N of Río Terebe across from Quebrada Huron, 300–900 ft, *Kirkbride & Duke 568* (MO). Fish Creek Mountains, Chiriqui Lagoon, *Wedel 2300* (US). CANAL ZONE: Barro Colorado Island, *Bangham 499* (US); *Croat 4093* (MO, SCZ), *4102, 4285, 4606, 4651, 6189, 6626* (all MO), *6653, 7298* (both MO, SCZ), *7379* (MO), *8228* (MO, SCZ), *8320, 8355, 8647, 9262, 10902, 11313, 11479, 12663, 16544* (all MO); *Dodge et al. 17002* (DUKE); *Dwyer et al. 8443* (SCZ); *Ebinger 233, 255* (both MO); *Foster 495, 598* (both DUKE), *1237* (DUKE, MO, PMA); *Kenoyer 448, 450* (both US); *Knight*, 1967–68 (MO); *Maxon et al. 6792* (US); *Shattuck 533, 759* (both MO); *Standley 31445* (MO, US), *31459, 41119* (both US); *Starry 300* (MO); *Wetmore & Abbe 81* (MO); *Woodworth & Vestal 548* (MO); *Zetek 3623* (MO). Gamboa Navy Pipeline Road, *Correa et al. 536* (DUKE, MO). W arm of Quebrada Salamanca, 70 m, *Dodge et al. 17002* (MO). Quebrada La Palma and Cañon of Río Chagres, 70–80 m, *Dodge & Allen 17364* (DUKE, MO). Pipeline Road, *Gentry 1946* (MO, SCZ), *3396* (MO). Headwaters of Río Chinilla above Nuevo Limon, *Maxon 6888* (US). Pipeline Road, *Mori & Kallunki 2416, 2825* (both MO). Río Mendosa above Pipeline Road bridge 8 km NW of Gamboa, 95 m, *Nee 7605* (MO). End of Pipeline Road 19 km NW of Gamboa, *Nee & Smith 11113* (MO). Hills N of Frijoles, *Standley 27445* (MO, US). COLÓN: Río Guanche 3–5 mi inland, 10–100 m, *Croat 26188* (MO). Santa Rita Ridge, *Foster & Morton 2218* (DUKE); *Gentry 6544* (MO). Near Peluca on road to Nombre de Dios, *Kennedy 2794* (MO). Trail behind Peluca meteorological station, *Kennedy & Dressler 2961* (MO). Río Guanche 2–5 km upriver, *Mori & Kallunki 3691* (MO). Santa Rita Ridge, *Mori & Kallunki 5049* (MO). Loma de la Gloria near Fató (Nombre de Dios), *Pittier 3853* (US). Between Peluca Hydrographic Station and Quebrada Peluca along Río Boqueron, *Steyermark & Allen 17227* (MO). DARIÉN: Cerro Pirre, *Bristan 1235* (MO); *Duke 261* (ECON, MO, OS), *6586* (MO). Without other locality, *Duke 8208* (MO, OS). Río Aretí and Manené, *Duke 8796* (MO, OS, US). Cerro Campamento, *Duke 15646* (MO). Trail from Tacarcuna Village on Río Tacarcuna to Cerro Mali, 800–1300 m, *Gentry & Mori 13617* (MO). Manene to mouth of Río Cuasí, *Kirkbride & Bristan 1395* (MO). Cerro Pirre, 300–700 m, *Mori & Kallunki 5398* (MO). Crest of Caná-Cuasí Trail, Chepigana District, 5500 ft, *Terry & Terry 1603* (MO). PANAMÁ: Cerro Campana, 2300 ft, *Blum et al. 2378* (SCZ). Cerro Jefe and Cerro Azul, *Correa & Dressler 718* (MO); *Dwyer 2053* (MO); *Dwyer & Hayden 8094* (MO); *Foster 1157* (MO, DUKE); *Foster & Kennedy 1821* (DUKE); *Gentry et al. 3396* (MO). Road to Cartí 16 km above El Llano, 350–400 m, *Kennedy 2543* (MO). Cerro Jefe, 3000 ft, *Lewis & Dressler 7581* (MO). El Llano-Cartí road 8–12 km from junction with Interamerican Highway, *Mori & Kallunki 2873, 3060, 3371, 4189, 5176* (all MO). Altos de Pacora 15–20 km WNW of Cerro Azul, *Mori et al. 6915* (MO). El Llano-Cartí road 8 km N of Panamerican Highway, 450 m, *Nee & Warmbrodt 10358* (MO). SAN BLAS: Permé, *Cooper 247* (US). Between Río Diablo and Río Aretí, *Duke 14884* (MO).

13. **Tovomitopsis standleyana** (L. O. Williams) D'Arcy, comb. nov.

Chrysochlamys standleyana L. O. Williams, Trop. Woods 111: 16. 1959. New name for *C. pauciflora* Standley.

C. pauciflora Standley, Ceiba 3: 214. 1952 [1953]. non Walp. (1842). TYPE: Panama, *Wedel 1019* (F, holotype; MO, isotype).

Tree or *shrub* to 6 m tall, twigs slender; sap yellow, sticky. *Leaves* obovate or elliptical, to 20 cm long, 7 cm wide, apically acuminate, the tip minutely callose, basally obtuse, or acute; costa subplane above, elevated and conspicuous beneath, especially proximally, the lateral veins 7–8(–10), wide spaced, arcuate, not forming a distinct submarginal vein, minor venation obscure, of weak irregular intermediate veins more numerous towards the apex of the leaf and well developed secondary lateral veins which form a reticulum; canals rarely evident, the major veins sometimes minutely puberulent beneath; petiole 1–3 cm long. *Inflorescences* terminal but sometimes soon lateral on short shoots, columnar or pyramidal cymose panicles, the main axis mostly unbranched, lateral branches short, compressed and sharply angled, minutely puberulent, bracts minute, bracteoles nearly basal, minute, glabrous, pedicels 4–6 mm long, terete, compressed or quadrate, becoming stout, 3 mm thick in fruit but not longer. *Flower* with buds globose, 4–5 mm across; outer sepals 2, basally imbricate, shorter than the bud, sometimes unequal, spreading, coriaceous, inner sepals 3, imbricate, over-

topping the bud; petals 5, imbricate, quincuncial, overtopping the bud; stamens numerous (70–80), free, the filaments unequal, thicker than the anthers, the central few apically bent down in bud, the anthers convergent upwards, the connective minutely apiculate; ovary obsolete; pistillate flowers not seen. *Fruit* drying reddish, subglobose, the body 10–12 mm across, rounded-sulcate, apically flat or depressed, surmounted by the persistent, subsessile styles, 2 mm long, basally narrowed into an obconical stipe 7 mm long and ca. 5 mm wide.

This species is easily confused with *T. nicaraguensis*, which occupies similar habitats in Panama but which is usually a larger tree. The leaves of *T. standleyana* seldom dry brown, and the mature fruits are smaller with less pronounced apiculum but relatively similar stipe. The inflorescence of *T. standleyana* is usually less puberulent than that of *T. nicaraguensis*, and the mature flower buds are usually slightly larger.

Tovomitopsis standleyana occurs in Costa Rica, Panama, Colombia (Chocó) and Peru. It may not be distinct from some South American material going under other names.

BOCAS DEL TORO: Changuinola Valley, *Cooper & Slater 71* (US). Near Quebrada Lugron and Cerro Boynic near Río Terebé, 300–900 m, *Kirkbride & Duke 643* (MO). Near Almirante, 100 m, *Lao & Gentry 447* (MO); *Nee & Hansen 14103* (MO); *Slater 68* (US). Chiriqui Lagoon, *Wedel 1019* (F, MO). Fish Creek Hills, *Wedel 2300* (MO). COCLÉ: N of El Valle, 1000 m, *Allen 3683* (MO). La Mesa above El Valle, *Croat 14394* (MO). Cerro Pilón, 700–900 m, *Duke 12153* (MO). La Mesa, 2500 ft, *Dwyer & Duke 8267* (MO). Cerro Pilón, *Dwyer & Lallathin 8680* (MO). Cerro Gaital, Caracoral, 2700–3200 ft, *Dwyer 8947* (MO). Above El Valle, 1000 m, *Gentry 5651, 5659* (both MO). Cerro Pilón, 800–945 m, *Mori et al. 6562* (MO). La Mesa, 875 m, *Nee & Dwyer 9159* (MO). COLÓN: 2–3 mi up Río Guanche, *Kennedy & Foster 2193* (MO). 10 mi SW of Portobelo and 2–4 mi from the coast, 10–200 m, *Liesner 1048* (MO). VERAGUAS: 15.6 km NW of Santa Fé, *Croat 27581* (MO). 0.6–1.8 mi beyond Escuela Agricola Alto Piedra (Santa Fé), 730 m, *Croat & Folsom 34053, 34265* (both MO). 5 mi W of Santa Fé past Escuela Agricola Alto Piedra, 800–1200 m, *Liesner 889* (MO). Slopes of Cerro Tute NW of Santa Fé, *Mori & Kallunki 4794* (MO).

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FLORA OF PANAMA

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

PART VI

FAMILY 124. CISTACEAE

Although listed in indexes to the families to appear in the Flora of Panama, the Cistaceae has not been found in Panama nor is it expected. The family, which includes herbs and shrubs, occurs in temperate regions of the world, especially in the Mediterranean area.—W. G. D'Arcy.

ANN. MISSOURI BOT. GARD. 67: 1045. 1980.

FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part VIII

FAMILY 151. THEOPHRASTACEAE

W. G. D'ARCY[2]

Shrubs or *trees*, rarely acaulescent; sometimes dioecious, wood often brittle and breaking along enlarged rays. *Leaves* simple, opposite, mostly coriaceous, entire or serrate, sometimes spinose, the venation pinnate, all species with characteristic linear sclereids running under the epidermis oriented without reference to the venation. *Inflorescences* short or elongate racemes, mostly with minute bracts subtending the short pedicels. *Flowers* white, orange or green, 3–5 merous, the sepals imbricate; corolla rotate or campanulate, basally united into a short tube, the lobes mostly rotund; staminodes inserted on the corolla near the base of the tube or at the mouth, often resembling the petals; stamens free or united, the anthers with the thecae distinct but coalescent, the ovary 1-locular, the placentation free central, ovules numerous, multiserriate, anatropous. *Fruit* a berry or drupe, the pericarp coriaceous or testaceous, indehiscent; seeds few or numerous, often immersed in a soft or gelatinous pulp; embryo straight, endosperm present.

This family of about five genera is centered in the Caribbean area with small genera, *Deherania* (Guatemala to Costa Rica), *Theophrasta* (Hispaniola), and *Neomezia* (Cuba) of local occurrence, and the two larger genera, *Jacquinia* and *Clavija* of much wider occurrence. *Jacquinia* occurs mainly in open hapitats of northern South America, the Antilles and and Central America, while *Clavija* occurs in deep humid forest with species more abundant in South America.

In some places species of *Jacquinia* are used as barbascos to kill fish, while in some places, fruits of *Clavija* are eaten by man.

Although there are two monographs of the family, one based on gross morphology (Mez, 1904) and one on foliar anatomy (Votsch, 1904), the taxonomy of the group is far from understood. There are difficulties in the study of this family: the small genera are known by only very scant material; *Jacquinia* is abundantly represented in herbaria, but plasticity makes species difficult to separate, and herbarium specimens of *Clavija* usually lack floral information adequate for understanding of species or relationships.

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[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator).

[2] Missouri Botanical Garden, Box 299, St. Louis, Missouri 63166.

ANN. MISSOURI BOT. GARD. 67: 1047–1055. 1980.

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a. Leaves small, less than 4 cm wide, spine tipped; plants freely branching; flowers perfect ---------- 2. *Jacquinia*

aa. Leaves large, more than 6 cm wide, lacking spines; plants unbranched; flowers unisexual and plants dioecious ---------- 1. *Clavija*

1. CLAVIJA

Clavija Ruiz & Pavón, Fl. Peru. Chil. Prodr. 142, *tab. 30*. 1794. SYNTYPES: *C. macrocarpa* Ruiz & Pavón, *C. longifolia* Ruiz & Pavón, *C. spathulata* Ruiz & Pavón and *C. pendula* Ruiz & Pavón.

Shrubs or *trees*, erect, mostly unbranched. *Leaves* simple, alternate, clustered at the tip of the stem, mostly elongate, entire or serrate, mostly coriaceous and glabrous, with numerous linear sclereids running beneath the epidermis. *Inflorescences* dioecious, mostly cauliflorous racemes clustered amongst the leaves; peduncles slender in flower, stouter in fruit; pedicels subtended by minute bracts. *Flowers* 3–5 merous, the sepals small, rotate, persistent; petals united into a short tube, rotate, the lobes rotund, fleshy, bearing staminodes as thickened appendages at the corolla mouth; staminate flower with the filaments united into a stipe-like tube, the anthers forming a peltate disc at the mouth of the corolla, dehiscing on the lower surface, the gynoecium rudimentary or wanting; in pistillate flowers, the stamens free, reduced and sterile; ovary glabrous, the stigma subsessile. *Fruit* a coriaceous berry, mostly globose, the pericarp becoming hard, brittle; seeds several, the embryo straight.

This genus includes several dozen species of humid forests of tropical America. In the field, they may usually be recognized by their erect, unbranched habit, elongate coriaceous leaves and globose fruits. In the herbarium, the linear sclereids just beneath the leaf epidermis is a near-diagnostic feature, occurring otherwise only in *Correlliana* D'Arcy, Myrsinaceae, which differs in inflorescence and flora characters.

The taxonomy of this genus is extremely difficult to study, for most herbarium specimens have little in the way of floral material suitable for comparison. Leaves of different species often look quite similar, and it is not always possible to determine species on vegetative characters alone. Whether leaves are entire or have spines seems to be a variable character within species and cannot be relied upon for taxonomic separations. Perhaps field studies looking at the nature of plasticity under different growing conditions would be useful.

Quite similar to *Clavija* in aspect are *Gustavia*, Lecythidaceae, *Corelliana*, Myrsinaceae, and a number of genera in other families, but only *Clavija* and

Corelliana have the linear sclereids in the leaf lamina. For a review of these genera see D'Arcy (1973).

a. Leaves glabrous or with minute trichomes when viewed under high magnification.
  b. Leaves broadest near the middle; petioles slender ..... 1. *C. biborrana*
  bb. Leaves broadest well above the middle; pedicels mostly stout.
    c. Minor venation visibly reticulate and low elevated above; leaves mostly narrow, less than 8 cm wide ..... 4. *C. spathulata*
    cc. Minor venation mostly inconspicuous; leaves mostly more than 8 cm wide ..... 2. *C. jelskii*
aa. Leaves evenly short pilose beneath with erect hairs ..... *C. pubens*

1. **Clavija biborrana** Oerst., Vidensk. Meddel Dansk Naturhist Foren. Kjobenhavn 1861: 117. 1861. TYPE: Costa Rica, *Oersted 31A* (C, not seen; GH, photo).

Erect *shrub* to 4 m tall, unbranched, the leaves born at the stem apex, the leaf bearing portion of the apex mostly 4–5 mm wide. *Leaves* ovate, acute or acuminate at each end, mostly 15–25 cm long, 5–9 cm wide, entire, stiff and coriaceous, often drying with a light gray cast, the lateral veins nearly straight, only slightly ascending, forking near the margin and forming a submarginal vein and in places a marginal vein, the minor venation indistinct, the tertiary veins more or less at right angles to the secondaries near the center of the leaf; petiole unwinged or inconspicuously so, slender, flat and drying angled, slender, elongate, often drying black in the basal 1 cm, glabrous. *Inflorescences* (ex Mez) few flowered, ca. 10-flowered, laxly racemose, glabrous, much shorter than the leaves; pedicels slender, to 3 mm long; bracts narrowly triangular bearing scales near the base. *Flowers* (ex Mez) small or to 5 mm diam., the sepals ovate, rotund, fimbriate-crenulate; staminodes thick, subglobose, not joined, the anthers free, exserted, the free part of the tube shorter than the anthers. *Fruit* (immature) globose, minutely apiculate, subtended by the persistent, greenish, applied sepals, 5–10 mm across.

Described from Costa Rica, this species has been found in several parts of lowland Panama. Material cited here is only tentatively determined, and the name used is based on the appearance of the type photo. This species appears to be distinct in its elongate inconspicuously winged slender petiole, and in its entire symmetrical and relatively broadly elliptic leaves which are widest about the middle. All fruit seen was quite immature, and it is not known how large it may grow.

BOCAS DEL TORO: Chiriquí Lagoon, *Wedel 1024* (MO). COCLÉ: El Valle de Antón, *Duke 13238* (MO, OS). Mountains beyond La Pintada, 400–600 m, *Hunter & Allen 580* (MO). El Valle, *Lindsay 411* (MO). DARIÉN: S slope of westermost peak of Tacarcuna massif, 800–1200 m, *Gentry et al. 16963* (COL). PANAMÁ: Cerro Campana, *Croat 17223* (MO); *Kirkbride & Hayden 293* (MO, SCZ); *Smith & Smith 3378* (US).

2. **Clavija jelskii** Szyszyl. Diss. Cl. Math. Phys. Acad. Litt. Cracov. 29: 225. 1894. TYPE: Peru, *Jelski 260* (W, not seen; MO, photos).—FIG. 1.

C. costaricensis Pittier, Contr. U.S. Natl. Herb. 20: 131. 1918. TYPE: Costa Rica, *Cook & Doyle 551* (US-474411, holotype).

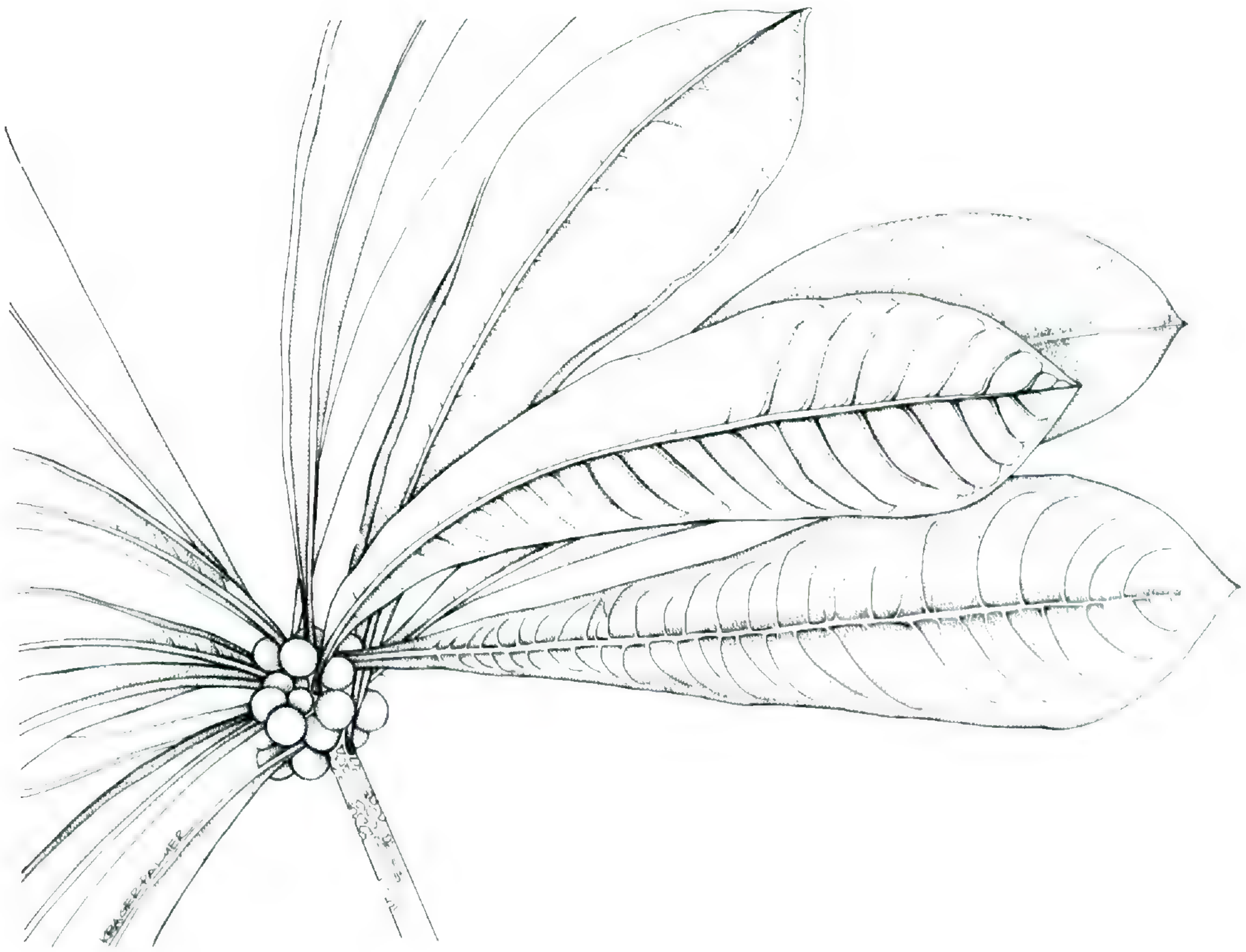

FIGURE 1. *Clavija jelskii* Szyszyl. Habit (×⅛). [After *Dwyer & Gentry 9376* (MO).]

Unbranched *shrub* 1–4 m tall; leafy portion of twigs 5–20 mm thick. *Leaves* large, 30–50 cm long, obovate, apically acute, basally cuneately attenuate into the petiole, entire or with shallow teeth, the lateral veins prominent, elevated beneath, nearly straight, evanescent towards the margin, branching to form an inconspicous and somewhat irregular marginal vein, the minor venation indistinct beneath, sometimes appearing somewhat reticulate above, coriaceous, mostly drying light green; petioles stout, especially at the darkened base, narrowly winged to 2–3 cm from the base, or conspicuously narrow winged to within 10 mm of the base. *Inflorescences* cauliflorous racemes clustered amongst the leaves, the peduncles slender, minutely puberulent, drying orange-yellow, to 15 cm long, the flowers evenly spaced; pedicels ca. 1.5 mm long, subtended by a single, cucullate, ciliolate bract 0.5–1 mm long; staminate flowers ca. 5 mm across, rotate, the sepals 4, rotate, 1–1.5 mm long, cucullate, the margins hyaline; petals forming a tube ca. 1 mm long, shorter than the sepals, the petals rotund, fleshy, orange, staminodes reduced to small flaps at the corolla mouth; filaments united into a narrow spike in the floral center, the 4 anthers connivent into a peltate disc, lobed and dehiscing on the underside where impressed by the staminodial flaps; pistillate inflorescences apparently much more contracted than the staminate, pistillate flowers not seen. *Fruits* globose, to 4 cm across, sometimes minutely apiculate, yellowish, the pericarp becoming hard, brittle, minutely muricate; seeds numerous, drying dark reddish brown.

This species is apparently widespread in tropical America, occurring in tropical wet and moist forests. Although the material cited for this species is superficially uniform, it is questionable that it is really all the same species. Therefore, the name employed here must be considered as provisional.

CANAL ZONE: Mojinga swamp near mouth of Río Chagres, *Allen 856* (MO). Navy reservation N of Gamboa near Río Mendosa, *Dressler 2899* (PMA). Bank of Río Agua Salud between Frijoles and Pipeline Road, *Foster and Kiester 1945* (DUKE, MO). Crest ridge along road to battery 7, area W of Limón Bay, Gatun Locks and Gatún Lake, *Johnston 1802* (A, MO). Pipeline Road N of Gamboa, *Luteyn & Foster 1557* (DUKE). 12 mi S of Colón on Río Providencia, *Tyson & Blum 3986* (MO). CHIRIQUÍ: Without other locality, *Cooper & Slater 191* (MAD). San Bartolo Limité, 12 mi W of Puerto Armuelles, 400–500 m, *Liesner 202A* (MO). Between Cañazo and Cocos near Puerto Armuelles, *Stern & Chambers 142* (F, MAD, MO). COCLÉ: Below Cerro Pilón, *Croat 13472* (MO). COLÓN: 9 mi S of Portobelo, *Croat 11381* (MO). Santa Rita Ridge, *Dwyer & Gentry 9376, 9561* (both MO). DARIÉN: Mouth of Río Yapé, 20 m, *Allen 343* (MO). Panamerican Highway near Jenine, Rio Cañita, *Duke 3849* (MO). 10 mi S of El Real on Río Pirre, *Duke 5470* (GH, MO). 1–3 mi N of Paya, *Duke & Kirkbride 14002* (NY). Santa Fé, *Duke 14273* (MO). Yaviza along Río Chucunaque, *Stern et al. 88* (GH). Caná, 2000–6500 ft, *Williams 806* (NY, US). PANAMÁ: Camino a Llano-Cartí, *Correa & Sucre 1842* (MO, PMA).

3. **Clavija pubens** D'Arcy.[3] TYPE: Panama, *Cooper 281* (NY, holotype; US, isotype).

Erect, unbranched "*shrub* or small *tree* 2 ft. tall (Cooper)." *Leaves* obovate, broadest slightly above the middle, acute at both ends, entire, 25–35 cm long, 9–12 cm wide, coriaceous, copiously pubescent beneath with erect, soft hairs, more or less concolorous, the lateral venation nearly straight and slightly ascending, forking and anastomosing ca. 1 cm from the margin to form a more or less distinct submarginal vein; petioles slender, basally unwinged, 1–4 cm long, drying basally dark. *Inflorescences* short, perhaps reduced. *Flowers* not seen. *Fruit* globose, minutely apiculate, minutely muricate, drying yellowish; seeds drying dark red, ca. 2.5 cm across.

This species resembles *C. costaricense,* and both sheets of the type collection were annotated with that name by Gunnar Harling in June 1964. However, pubescent leaf undersides are unknown to me in that species, and the lateral vein termination into an undulate submarginal vein is much more distinct than in material seen of *C. costaricense*. This species was recognized in the herbarium by Standley as distinct.

SAN BLAS: Permé, *Cooper 281* (NY, US).

4. **Clavija spathulata** Ruiz & Pavón, Syst. Veg. Fl. Peru. Chil. 1: 285. 1798, non Hooker (1844). TYPE: Peru, *Pavón* (G-DC, not seen; MO, microfiche).

Theophrasta longifolia Jacq., Coll. 4: 136. 1790. TYPE: Venezuela, *Jacquin* (W, not seen; MO, photo).
Calvija ornata D. Don, Edinburgh Philos. J. 10: 236, 1831; Bot. Reg. *tab. 1764*. 1836. TYPE: Not seen. Nom. illeg. incl. spec. prior., *Theophrasta longifolia* Jacq.
C. longifolia (Jacq.) Mez, in Urb., Symb. Ant. 2: 438. 1901, nec *C. longifolia* Ruiz & Pavón (1798) non *C. longifolia* Rusby (ined.).

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[3] *Clavija pubens* D'Arcy, spec. nov. *Clavija costaricense* simile, differt foliis subtus pilosulus; venis foliorum valde distinctis.

C. mezii Pittier, Contr. U.S. Natl. Herb. 20: 132. 1918. TYPE: Panama, *Pittier 4313* (US-679440, holotype; NY, US, isotypes).
C. allenii Lundell, Ann. Missouri Bot. Gard. 28: 452. 1941. TYPE: Panama, *Allen 2671* (MO, holotype; MICH, isotype, fragm. not seen).

Tree to 10 m tall; leafy portion of the stems 5–7 mm wide. *Leaves* narrowly obovate, widest ⅔–¾ way up, apically acute or acuminate, basally cuneate, 30–40 cm long, 7–9 cm wide, stiff and coriaceous, glabrous, entire or inconspicuously serrate, drying with the minor venation conspicuously elevated reticulate; cuneate and winged to near the base, the slender petiolar area relatively stout, 1–2 cm long, drying dark. *Inflorescences* short, becoming stout, not clearly observed, the branches drying dark reddish brown (Lundell) pendulous, few flowered, to 36 cm long, sparingly minutely puberulent. *Flowers* (ex Lundell) 4-merous; sepals basally united, suborbicular, 1–1.2 mm long, fimbriate; corolla ca. 1 cm diam., 6 mm long, orange, the lobes subrotund; ovary of staminate flowers spike-like.

This species is distinct from other Panamanian elements of the genus in the coriaceous reticulation of the leaves which sometimes dry somewhat shiny. It is likely that an older name will be found for this species, perhaps *C. reticulata* Cuatr., or another much earlier name. It somewhat resembles the type of *C. mezii* Pittier, an earlier name from Panama, but that species is here interpreted to be a synonym of *C. spathulata* R&P.

CANAL ZONE: Madden Dam, 100 m, *Allen 2671* (MICH, MO). DARIÉN: 2–3 mi SE of El Real, *Duke 4856* (US). PANAMÁ: Without other locality, *Duke 5560* (US); *Hayes 804* (NY). SAN BLAS: Isla de Soskatupu, *Duke 8961* (MO, OS). Isla Pino near Mulatupo, *Elias 1724* (MO). Forests around Puerto Obaldía, 0–50 m, *Pittier 4313* (NY, US).

2. JACQUINIA

Jacquinia L., Fl. Jam. 27. 1759, "*Jaquinia*." TYPE: *J. ruscifolia* Jacq. = *J. aculeata* (L.) Mez.

Bonellia Bert. ex Colla, Hortus Ripul. 21. 1824. TYPE: *B. cavanillesii* Colla, nom. illeg. = *J. macrocarpa* Cav.

Glabrate *shrubs* or small *trees*; wood brittle. *Leaves* mostly alternate or pseudoverticillate, entire, spinulose tipped, mostly coriaceous and rigid, short petiolate; stipules acicular, or wanting. *Inflorescences* short racemes or rarely solitary flowers, mostly terminal or nearly so; stipuliform bracts sometimes present; bracteoles wanting. *Flowers* mostly perfect, 5-merous, either white or orange; calyx with sepals free or basally connate, imbricate, rotund, sometimes ciliate or crenate; corolla salverform, the tube straight, campanulate or urceolate, the lobes imbricate, rotund, thick but thinning at the margins; staminodes 5, resembling the corolla lobes, connate to the top of corolla tube but free above, sometimes dorsally appendaged; the filaments flat, narrowing upwards, basally connate into a tube which is basally adnate to the corolla tube, the anthers ovate, pointed, exserted, the thecae separated dorsally, longitudinally dehiscent, nearly basifixed; ovary conical unilocular, the ovules many, the style not demarcated from the ovary, the stigma peltate, entire or minutely lobed. *Fruit* a coriaceous berry, ovoid, elliptical or globose, sometimes cuspidate, the pericarp thick; seeds large, 1–numerous, immersed in a spongey or mucilaginous pulp.

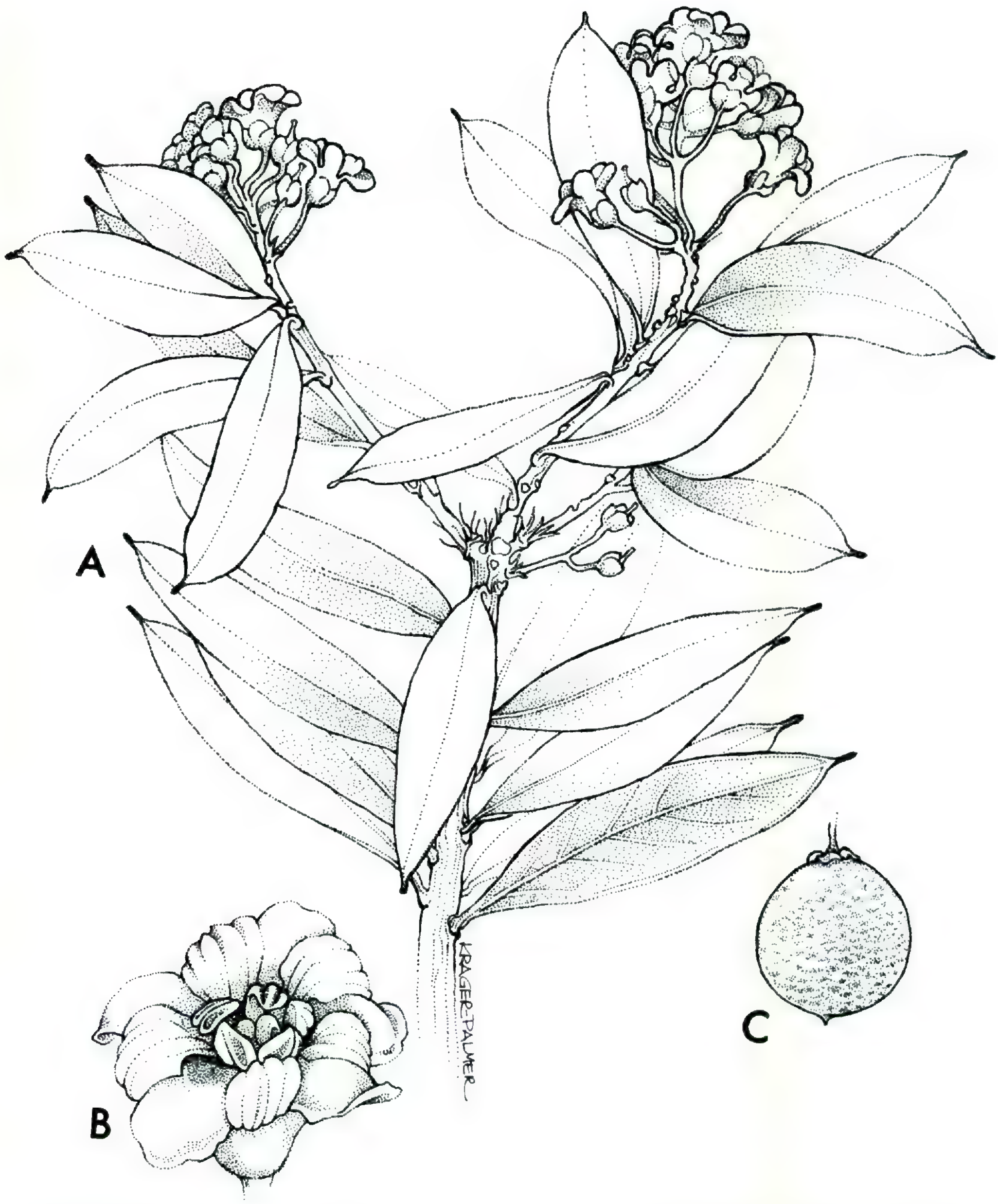

FIGURE 2. *Jacquinia macrocarpa* Cav.—A. Habit (×7/10).—B. Flower (×2⁴/₅).—C. Fruit (×7/10). [After *D'Arcy 5236* (MO).]

Jacquinia is a genus of about 30 species mainly of Central America and the Caribbean region. Species of Central America and some from South America and the Greater Antilles have orange flowers while most of the others from the Antilles and northern South America have white flowers. The flower color seems to speak for a separation of the genus into two reasonable groups.

The orange flowered species are difficult to separate, and while there is considerable variation between populations and individuals, and some populations

seem to represent quite different species from others, it is nevertheless extremely difficult to find separation points in the more or less continuous variation. Keys produced by Mez (1903) and Votsch (1904) are difficult to use and may not reflect differences between valid species.

Jacquinia in Panama is usually easy to recognize by its spine-tipped coriaceous leaves, bright orange flowers, globose, rotund fruits, and coastal habitat. Only one species is present.

Species of this genus have been used in many places as barbascos or fish poisons.

1. **Jacquinia macrocarpa** Cav., Icon. 5: 55. *tab. 483.* 1799. TYPE: Pacific coast of Panama, *Cavanilles* (B-WILLD., lectotype, not seen; MO, microfiche).—FIG. 2.

J. panamensis Lundell, Ann. Missouri Bot. Gard. 27: 329. 1940. TYPE: Panama, *Allen 985* (MICH, holotype, not seen; MO, US, isotypes).

J. aurantiaca mult. auct., ?Ait., Ind. Kew., ed. 2. 6. 1811. TYPE: probably Tres Marias Is., Mexico, *Menzies* (K).

Shrub or small *tree* to 8 m tall; branches brittle; stems drying dark reddish brown, the twigs scurfy puberulent, soon glabrescent. *Leaves* mostly elliptical, often narrow, mostly 5–7 cm long, 1.5–2.5 cm wide, apically obtuse or acute with a strong dark spine, basally obtuse or rounded, the margins often revolute, coriaceous, drying light green, the costa impressed and obscure above, prominent beneath, the lateral veins inconspicuous 5–9, forming a submarginal vein, minor venation not evident; petioles ill defined, 3–6 mm long; stipules linear to lanceolate, 1–6 mm long, scruffy puberulent. *Inflorescences* short condensed terminal or axillary racemes, round topped, the peduncle and the rachis 1–3 cm long; pedicels ca. 1 mm long, drying orange, subtended by cucullate, lanceolate, ciliolate bracts 3–7 mm long. *Flowers* showy orange; calyx cupular, 5–6 mm long, of 5 rounded, ciliolate, imbricate sepals; corolla salverform, the tube ca. 5 mm long, 3 mm wide, the 5 petals rotund, ca. 5 mm long, thinning at the margin; staminodes resembling the petals, but narrower, with 4 longitudinal adaxial ridges (appendages); stamens 5, the filaments flat, basally fused into a tube narrowing upwards, the anthers yellowish white, ovoid, acute, converging around the style; ovary conical, the style not demarcated, the stigma peltate. *Fruit* a coriaceous berry, ovoid or ellipsoidal, 3–4 cm across, brown, rugose, the pericarp ca. 5 mm thick; seeds 1–several, ca. 2 cm long, faboid, immersed in a soft yellowish matrix.

Jacquinia macrocarpa may be recognized by its bright orange flowers which are sometimes showy, and by its sharp spined leaves. This species has brighter, showier flowers, larger fruits and larger leaves than most other species in the genus. In Panama it is confined to the Pacific Coast where it grows along the strand with *Hippomane mancinella* L. (Euphorbiaceae). The one tree cultivated on Barro Colorado Island and *Hunter & Allen 657* from the Río Boquerón demonstrate that the species is well able to thrive in inland situations.

CANAL ZONE: BARRO COLORADO ISLAND: *Croat 4119a, 6904* (both MO); *Ebinger 600* (F, MO, US); *Foster 1677* (MO); *Zetek 5011* (MO). COCLÉ: Aguadulce, *Pittier 4990* (US). LOS SANTOS: Monagre Beach, *Lewis et al. 1676* (MO); *Tyson et al. 2888* (MO). Bejuco, *Allen 985* (MO, US). PANAMÁ:

Nueva Gorgona, *Allen 3763* (MO); *D'Arcy 5236* (MO); *D'Arcy & D'Arcy 6281* (MO); *Duke 4530* (MO). Isla de La Bayoneta, Perlas Islas, *Dwyer 1739* (MO). Río Boquerón above Peluca Hydrographic Station, 90 m, *Hunter & Allen 657* (MO). Gorgona Beach, *Miller 1796* (US); *Woodson et al. 1696* (F, MO).

Index of Latin Names

Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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FLORA OF PANAMA[1]

BY ROBERT E. WOODSON, JR. AND ROBERT W. SCHERY
AND COLLABORATORS

Part IX

FAMILY 173. PEDALIACEAE

W. G. D'ARCY[2]

Mostly *herbs*, often succulent, seldom *shrubs*, mostly with glandular hairs. *Leaves* opposite below, sometimes alternate upwards; petiolate, entire, toothed or lobed, often viscid, estipulate. *Inflorescences* of solitary flowers or few flowered cymes, axillary. *Flowers* perfect, zygomorphic, the calyx (4–)5 lobed to near the base; rarely saccate; corolla sympetalous, campanulate or tubular, 5-lobed, 2-lipped, the lobes imbricate in bud, sometimes gibbous; stamens 4, didynamous, the staminode posterior, the anthers free but often converging, 2-celled, longitudinally dehiscent the connective terminated by a gland; pistil 1, the ovary superior, the carpels 2 (3–4), the locules (1–) 2 or 4, the ovules 1–many in each locule, axile, anatropous, the style 1, slender, the stigmas 2. *Fruit* a loculicidal capsule, often appendaged with hooks, spines or wings; seeds occasionally somewhat winged, the embryo straight, the endosperm thin.

The Pedaliaceae is closely allied to the Martyniaceae with which it is often united, the major distinctions being that the New World Martyniaceae has parietal placentation and woody, indehiscent fruits while the Old World Pedaliaceae has axile placentation and dehiscent fruits. These distinctions are not convincing. The Pedaliaceae (and Martyniaceae) are similar to the Scrophulariaceae, Bignoniaceae and Acanthaceae, and close alliance has been postulated with the first and last of these families.

In Panama, only the genus *Sesamum* is known, and that from cultivated plants which escape and are perhaps naturalized. The balance of the family, which includes about 12 genera, is confined to the Old World tropics, ranging from Africa to the Philippines. *Martynia* and *Proboscidea* of the Martyniaceae have species in Mexico and further south in Central America, while *Craniolaria*, also Martyniaceae, has species in Venezuela and further south in South America. It would not be surprising to encounter species of these genera in Panama, for they are sometimes cultivated for their curious fruits and have been carried from place to place for ritual purposes by indigenous populations. Members of these genera are similar to the one treated here but tend to be more robust, more viscid pubescent, and they have large, woody, fruits with formidable hornlike processes which can damage cattle.

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[1] Assisted by National Science Foundation Grant DEB 77-04300 (W. G. D'Arcy, principal investigator).

[2] Missouri Botanical Garden, Box 299, St. Louis, Missouri 63166.

ANN. MISSOURI BOT. GARD. 67: 1057–1059. 1980.

Literature:

Bruce, E. A. 1953. Notes on African Pedaliaceae. Kew Bull. 8: 417–429.
Nayar, N. M. & K. L. Mehra. 1970. Sesame: its uses, botany, cytogenetics and origin. Econ. Bot. 24: 20–31.

1. SESAMUM

Sesamum L., Sp. Pl. 634. 1753. Gen. Pl., ed. 5. 282. 1754. TYPE: *S. indicum* L.

Erect or prostrate *herbs*, often viscid pubescent with glandular hairs and with subsessile glands. *Leaves* opposite, but sometimes with alternate or cyclical leaves above, entire, serrate, lobed or dissected and sometimes pubescent with subsessile, peltate 4-celled trichomes and with elongate hairs, mostly petiolate. *Inflorescences* solitary flowers in the upper leaf axils, pedicellate or subsessile; bracts and bracteoles, wanting or obsolete. *Flowers* sometimes showy, yellow, red, purple or pink; calyx deeply 5-lobed, the lobes similar; corolla campanulate, 5-lobed, slightly 2-lipped, slightly gibbous basally, glandular with short-stipitate 2–4 celled glands; stamens 4, the anthers oblong, versatile, the locules parallel, the connective dorsally thickened and terminated by a gland; ovary oblong, the locules longitudinally demarcated, hispid, the style abrupt, slender. *Capsule* oblong, longitudinally grooved or 4-angled, opening apically; seeds numerous, sometimes compressed, smooth or ridged, sometimes rugose, minutely 4-angled.

Sesamum is native to the Old World and Australia with 18–34 species depending on classification. The greatest number of species is in Africa and India. Various authors have divided *Sesamum* into smaller genera. The 4-celled glandular trichomes are unusual or perhaps unique in the Panamanian flora.

A number of species are important crop plants providing edible oils and highly nutritious meals which are used for humans and animals. In addition to *Sesamum indica* treated here, *S. radiata* Schum. & Thonn. has been cultivated in Central America and is perhaps naturalized. It is distinct from *S. indica* in its usually narrowly spatulate leaves and winged and rugose seeds.

1. **Sesamum indicum** L., Sp. Pl. 634. 1753. LECTOTYPE: Herb. Linnaeus (LINN 802.3, not seen; MO, microfiche).

S. orientale L., Sp. Pl. 634. 1753. TYPE: not seen.

Erect, fetid, glandular pubescent, annual *herb* to 2 m tall, somewhat branched; stems 4-angled. *Leaves* opposite below, often alternate above, variable in shape, entire, serrate, palmately lobed or nearly compound, 8–15 cm long, 6–10 cm wide, pubescent above and below and with copious 4-celled short-stalked glands beneath, the petioles ca. 5 cm long, often pilose. *Inflorescence* a single flower or 2–3 flowers in the upper leaf axils; pedicels 1–2 cm long with 2 yellow or black basal nectaries. *Flowers* white, rose or purple, mostly maculate; calyx 6–8 mm long, deeply 5 lobed, the lobes similar, acute or acuminate; corolla campanulate, basally minutely saccate, slightly 2-lipped, pubescent outside and with 1–4 celled glands; anthers pale yellow with a short white or brownish beak; ovary pilose, erect, brown or purple, grooved, with 4 rounded angles, the style slender, gla-

brous. *Fruit* apically dehiscent, to 3 cm long, oblong, glabrate to hirsute; seeds smooth or minutely rugose, to 3 mm long.

This species is distinct in its usually broad leaves and smooth unwinged seeds. The plants and corolla superficially resemble members of the Scrophulariaceae or Gesneriaceae, but the 4-celled glandular trichomes are distinctive.

Sesamum indicum is cultivated in Panama from time to time for its oil producing seeds, and sometimes it escapes or is persistent after planting. It is known as "sesame" (English) or "ajonjoli" (Spanish).

LOS SANTOS: Cultivated, Monagre Beach, *Dwyer 1965* (MO). PANAMÁ: Planted, Rió Tapía, *Standley 30657* (MO).

INDEX OF LATIN NAMES

Numbers in **bold face** type refer to descriptions; numbers in roman type refer to synonyms; numbers with daggers (†) refer to names incidentally mentioned.

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Bignoniaceae 1057†
Craniolaria 1057†
Gesneriaceae 1059†
Martynia 1057†
Martyniaceae 1057†
Pedaliaceae **1057**
Proboscidea 1057†
Scrophulariaceae 1057†, 1059†
Sesamum 1057†, **1058**
  indicum 1058†, **1058**, 1059†
  orientale 1058
  radiata 1058†

FLORA OF PANAMA

BY
ROBERT E. WOODSON, JR.
AND
ROBERT W. SCHERY
Missouri Botanical Garden
AND COLLABORATORS

Introduction and Indexes

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1943–1981

FLORA OF PANAMA

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Flora of Panama is a compilation of the indigenous and naturalized vascular plants of the Republic of Panama, following generally the system of Engler and Prantl. The treatments of the various families follow consecutively as nearly as is practicable and are of a critical nature, including synonymy, descriptions, and citation of representative Panamanian exsiccatae for each species. The compilers of the *Flora* have been aided in their work very materially by the extensive contributions of American and European specialists of wide repute in the case of numerous critical families. As is customary, such contributions are credited directly to the authors concerned.

Flora of Panama will appear in the ANNALS OF THE MISSOURI BOTANICAL GARDEN as contributions accumulate. Since the completed work will be extensive, it will consist of a number of parts designated numerically, each with separate pagination and pertinent illustrations. The first portion of the work to be published will begin the taxonomic treatment of the Gymnospermae and Monocotyledoneae, and will be designated as Part II. General discussions of historical, geographical, physiographic and floristic relations, to be published later, will constitute Part I. Full indices, together with *addendae* and *corrigendae*, will occupy the final part.

The unusual nature of *Flora of Panama* will necessitate a change in the policy of the Missouri Botanical Garden regarding reprints, which will not be generally distributed except to collaborators. Reprints of the various parts of the *Flora*, suitable for permanent binding, will be offered for sale by the Missouri Botanical Garden. Prices upon application.

MISSOURI BOTANICAL GARDEN
ST. LOUIS, MO.

PREFACE

Formally begun in 1943, the *Flora of Panama* is complete with this issue. The broadside distributed by Woodson as an insert in the first fascicle of the *Flora* and reproduced opposite this page is a prospectus of what was planned. The completed flora follows Woodson's guidelines remarkably closely, though significant changes and (we hope) improvements were made along the way by a succession of contributors and editors, many of whom were not even born when the project began. Over 100 scientists have contributed to its preparation, and publication has extended over 38 years, from 1943 to the present. A short description of the *Flora* is provided below, and a history of collecting activities by Dwyer updates his earlier (1964) paper on the subject. A symposium celebrating completion of the *Flora* was held in Panama in April 1980, and the keynote address given at that event by Peter H. Raven outlines the problems facing future activities in Panama and other developing countries. The *Flora of Panama* is a beginning in the assessment of plant diversity in Panama; many additions to this body of knowledge have already appeared in the literature, and many more additions and changes will be generated by further field work and study.—W. G. D'ARCY

THE *FLORA OF PANAMA*: HISTORICAL OUTLINE AND SELECTED BIBLIOGRAPHY

W. G. D'ARCY[1]

Formally begun in 1943, and prepared with the assistance of 103 contributors, the *Flora of Panama* includes coverage of over 6,200 species. Publication of the *Flora* in parts in the ANNALS OF THE MISSOURI BOTANICAL GARDEN ensured its wide distribution to botanical institutions around the world. It is the first attempt to survey all plants growing in Panama, and as such, it is the basis on which botanical studies in the future must rest. Although uneven in content and inadequate in some parts, it is nevertheless a good starting point for assessing plant diversity in the isthmus: the great increase in known diversity since the appearance of early parts of the *Flora* makes clear the need for further effort. It is likely that a final inventory of vascular plant species occurring in Panama will include 9,000–10,000 species.

Before commencement of the *Flora*, the Missouri Botanical Garden had for a number of years been interested in Panamanian plants beginning with the visit in 1922 by Jesse M. Greenman, then Curator of the Herbarium at the Garden. A tropical station was established in 1926 at Ancon which was at first concerned with providing living plants for show and study in the greenhouses in St. Louis, but which soon generated interest in the collection and study of herbarium specimens. Several scientific expeditions were sent to Panama in the 1930's and by the end of this decade several "Contributions toward a *Flora* of Panama" were published in the ANNALS OF THE MISSOURI BOTANICAL GARDEN. The history of this early period is related by Dwyer (1964), and the contents of the "Contributions" and the early parts of the Flora are reviewed by Robyns (1965). Croat's (1978) section on History of Botanical Studies also gives a good resumé of plant collecting activities in much of the country.

The *Flora* was initiated by Robert E. Woodson, Jr. (1904–1963) who edited the first parts with the assistance, until 1952, of Robert W. Schery (1917–). From about the time Schery's departure until the late 1950's there was a hiatus in activity on the *Flora*. In 1958 the *Flora* resumed publication with several contributors besides Woodson, most notably Loran C. Nevling, who was on the staff of the the Missouri Botanical Garden for much of 1949, and slightly later (from 1960) James A. Duke, who was a staff botanist at the Garden. The *Flora* received its first funding from the National Science Foundation in 1957, and support has been continuous since then. In the early 1960's activity on the *Flora* grew, as André Robyns was hired to direct the project, and momentum was sufficient that with the death of Woodson in 1963, publication continued almost uninterrupted. Walter H. Lewis became Director of the Herbarium in 1964, and he improved the activity and professional level of standards of the Flora project. In 1968, Duncan M. Porter replaced Robyns as editor, and by the time of his departure in 1972, Porter was able to boast that all remaining parts of

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the *Flora* had specialists committed to preparing the treatments. During Porter's time as editor of the *Flora*, contributions were made by Joan W. Nowicke who was hired to prepare treatments. Following Porter's departure the *Flora of Panama* project, which by now included an active field program, was directed by Thomas B. Croat, and the editorial aspects of the project were assigned to W. G. D'Arcy. In 1977, as he became engaged in a major study of the Araceae, Croat relinquished management of the project to D'Arcy who saw the *Flora* to completion.

In April 1980, with all treatments ready in at least manuscript form, a symposium was held in Panama City to celebrate completion of the *Flora*. This was supported by the Missouri Botanical Garden, the National Science Foundation, the University of Panama, the Smithsonian Tropical Research Institute, the Panamanian conservation commission (RENARE), the Joyce Foundation, and other organizations. About 350 participants gathered to hear a four day program of papers on Panama's natural history.

The concept of the *Flora* expanded somewhat over the years. Initially the number of species was thought to be small, and the published *Flora* was arranged so it could be extracted from the ANNALS for use as a separate manual. Thus early parts had "*Flora*" pagination as well as pagination of the ANNALS. In all cases citations should be made using the ANNALS pagination in the upper corners of the pages and not to the "*Flora*" pagination in lower center. The "*Flora*" pagination was discontinued after publication of the first parts of the Leguminosae in 1950. Other features of the *Flora* also expanded over time. From a policy of studying only material available in the Missouri Botanical Garden, it became normal procedure to borrow all Panamanian specimens from all institutions with significant holdings of Panamanian plants, the most noteworthy being: A, DUKE, F, GH, FSU, MO, OS, PMA, SCZ, and US, and especially important specimens were studied from many other institutions. In early parts of the *Flora*, cultivated and introduced plants were ignored, but later it became the rule to attempt to account for all species. Illustrations at first represented only a few of the families, but it later became the policy to include one illustration of each genus, and in large genera, one illustration for each 10 species. Original illustrations were preferred; only in a few cases were older illustrations republished. When it became evident that much of the flora must, because of the poor state of knowledge about neotropical plants, be revisionary in scope, and that a second edition of the *Flora* would be unlikely for many years, the *Flora* began to include information on nomenclatural typification, and many of the treatments became semi-monographic in scope.

Over the years there was a large increase in the quantity and quality of collections available to the collaborators on the *Flora*. In the 1930's most collections studied were those of Woodson and collectors directly concerned with production of the *Flora*, such as Paul C. Allen (1911–1963) Russell J. Seibert, and Julian A. Steyermark (1909–) although in some cases the collections of Paul C. Standley and others were reëxamined. In the 1960's a series of expeditions was sent to Panama from St. Louis, and a number of other collectors became important contributors to the available stock of herbarium material; John D. Dwyer and James A. Duke were perhaps most noteworthy at this time. Neither of these was

directly concerned with preparation of the *Flora* at the time when they did their most important collecting. Walter H. Lewis led several expeditions to Panama in the late 1960's and early 1970's, and his encouragement was of great importance in guiding the flora at that time. In about 1970, the assignment of Thomas Croat to prepare the Flora of Barro Colorado Island wrought great changes in the way that the Panamanian flora was to be perceived and studied. Croat became a resident in the isthmus for several years during which time he established a field station facility with housing, drying facilities and field vehicle capability. Croat and his successors at the station were able to make the first intensive collections of tropical wet forest regions. This ecological zone, which largely follows the Caribbean coast, is much richer in species than any other part of Panama, and it had been the least populated and least accessible. Families with important numbers of forest species were soon found to have twice as many or more species in Panama than had been supposed under even the most expansive earlier estimates. Families prepared before the early 1970's are found to have only a token representation of the flora actually present, and recently prepared families seriously understate the size of the actual flora. The intensive collecting program maintained since 1970, and especially the investigation of tropical wet areas, has revealed a flora much richer than previously suspected, and it has added excitement to the study of Panama's plant life. A result is that the *Flora* greatly understates the actual situation: continuing study will supplement what has already been published, and the *Flora* together with new publications of present and future workers will give a reasonable picture of the plant diversity in the Isthmus of Panama.

The *Flora of Panama* deals only with seed plants and includes just over 6,200 species. The pteridophytes are being treated separately by David B. Lellinger, Smithsonian Institution, together with the pteridophytes of Costa Rica and the Department of Chocó, Colombia. Lellinger (pers. comm.) estimates that he will record about 700 species from Panama. The bryophytes have not as yet been treated in floristic fashion, although active studies are under way by Prof. Noris Salazar and assocates at the University of Panama. Marshall R. Crosby, Missouri Botanical Garden, estimates (pers. comm.) that there are about 400 species of mosses in Panama. The total derived from the above estimates—7,300 species including seed plants, pteridophytes, and mosses—greatly underestimates the total flora, for the figure for seed plants omits many species. The total flora is more likely in excess of 9,000 species.

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THE HISTORY OF PLANT COLLECTING IN PANAMA (1700–1981)[1]

JOHN D. DWYER[2]

This talk is dedicated to the memory of Dr. Robert Woodson, Jr., late Curator of the Herbarium of the Missouri Botanical Garden and Professor of Botany at Washington University, who died in 1963. His name, together with that of Dr. Robert W. Schery, has been on the title page of every issue of the *Flora of Panama* in the ANNALS OF THE MISSOURI BOTANICAL GARDEN.

While this paper is historical in character, a point dealing with the present and the future will be made: that Panama is and will be in need of more intensive collection.

I estimate that about 750 botanists or naturalists have collected plants in Panama for permanent deposit in herbaria. This may seem to be an exaggeration, considering that my current unpublished list (see also Dwyer, 1964, 1968) includes the names of only 450 collectors. In defense of this estimate of 750 let me point out that new collectors can be found without much difficulty by examining herbarium specimens and through searching the literature. The list includes the names of all who have collected without regard to the quantity of collection numbers. The term "number" does not include duplicate material included under a specific number.

Throughout the world there are about one half million numbers of Panamanian plants. Of these about a quarter of a million are deposited in the Missouri Botanical Garden. In the last decade and a half five botanists from the Missouri Botanical Garden have collected approximately 50,000 numbers, these, for the most part, being gathered in non-team fashion (Table 1).

As this is a historical treatment of plant collecting in the Republic of Panama, we start at the beginning when in 1700 James Wallace collected several herbarium specimens in the ill-fated Scotch Colony on the Atlantic Coast of the old Province of Darién.

It is appropriate to divide the 280 years of plant collecting into 3 phases:

1. 1700–1914.
2. 1915–1957.
3. 1958–1981.

The first phase runs from the period of the Scotch Colony in Darién to the opening of the Panama Canal. The second period is marked initially by a lull period during and immediately after World War I, followed by some field work and considerable herbarium study, this to be again interrupted by a war, World War II. The third period, the golden period, extends from 1958, the year when William L. Stern and Kenton L. Chambers made an exciting collecting trip into Panama, up to the present time when herbarium material is being collected on a year-round basis.

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TABLE 1. Collectors with largest numbers of collections from Panama. * Indicates individual was a staff member of, student at or professional collector for the Missouri Botanical Garden.

*Croat, T.	23,000	*D'Arcy, W.	5,000
Standley, P.	7,500	Dressler, R.	4,000
*Gentry, A.	7,000	*Dwyer, J.	4,500
Duke, J.	6,000	*Hammel, B.	4,500
*Mori, S.	6,000	*Lewis et al.	3,700
*Folsom, J.	5,000	*Allen, P.	3,600
*Nee, M.	5,000	Pittier, H.	3,600
Tyson, E.	5,000	*von Wedel, H.	3,000

A glance at Table 2 shows that in the first period (1700–1914) a shift from domination of plant collecting by Europeans to an eventual takeover by North Americans is obvious. Some collections made in this period may never have been cited as exsiccatae, e.g. those of Joseph Jussieu, Robert Millar, and B. Roezl. Particularly noteworthy are the collections of Berthold Seemann, who wrote the first flora of Panama (Seemann, 1854) as well as those of Henri Pittier, numbering over 1,850, drawn from one end of Panama to the other (Dwyer, 1973). Several Christian Brothers living in Panama City collected several hundred numbers beginning in 1912. Interestingly, almost all the Americans who collected in the first period were from the eastern United States.

The second period (1915–1957) obviously overlaps somewhat with the first, making it the most difficult of the three to bring into proper perspective. Paul Standley's collection of 7,500 numbers in 5 months (end of 1923 and beginning of 1924, and one month in 1925) served as a basis for his Flora of the Canal Zone (Standley, 1928) and the Flora of Barro Colorado Island (Standley, 1927). He demonstrated his extraordinary ability in the field. His collections, mostly unicates, were confined to the Canal Zone and the vicinity of Panama City.

As early as 1922 Jesse M. Greenman, Curator of the Herbarium at the Garden, made a few collections of phanerogams in Panama, and in 1923 the Missouri Botanical Garden was attracted to Panama by the living orchid collection of a retired postman, C. W. Powell, living in Balboa. To house this collection, received as a gift, the Garden maintained a tropical station at Ancon Hill, Canal Zone, this surviving until 1939.

Beginning in 1934, up to the beginning of World War II, several botanists, functioning mostly in team fashion, collected throughout the isthmus, especially Paul Allen, Carrol Dodge, A. A. Hunter, Russell Seibert, Robert Schery, Julian Steyermark, and Robert Woodson, Jr. I estimate that their collections in Panama amount to fewer than 10,000 numbers. The figure would be considerably higher if the vast majority of the 5,000 specimens collected by Woodson, Allen, and Seibert in 1947 were not destroyed by fire. In this second period the greatest exhibition of collecting was by C. V. Piper of the U. S. National Herbarium who, in 1923, collected 1,000 numbers in 10 days!

From 1948 until his death in 1963 Woodson believed that Panama had been adequately collected, and that the *Flora of Panama* could be written successfully by relying almost exclusively on the collections in the herbarium cases of the Garden. In light of the experience of the last two decades, this was a great mistake

TABLE 2. Early collectors of Panamanian plants.

WALLACE, J.	Scottish	1700
JUSSIEU, JOS. DE	French	17??
MILLAR, R.	English	1734
MEE, L.	French	1789
HAENKE, T.	Bohemian	1780–1791
BILLBERG, J.	Swedish	1826
DAHLIN, E.	Finnish	1826–1831
CUMING, H.	English	1830–1831
HINDS, B.	English	1837 etc.
BARCLAY, G.	English	1837 etc.
SINCLAIR, A.	English	1837 etc.
LOBB, W.	English	1843
SEEMANN, B.	German	1846; 1847; 1848; 1849
WARSZEWIEZ, J.	Polish	1848; 1850
BEHR, H.	German	1848
FENDLER, A.	American	1848–1849
BALL, J.	Irish	1852
HALSTED, M.	American	1850–1854
KUNTZE, O.	German	1874
DUCHASSAING, E.	French	1849–1851
HAYES, S.	American	before 1863
ROEZL, B.	Czech	1869
HART, J.	English	1885
COWELL, J.	American	1905
HOWE, M.	American	1909–1910
WILLIAMS, R. S.	American	1908
PITTIER, H.	Swiss	1910–1911; 1914–1915
POWELL, C.	American	1907–1927
OSTENFELD, C.	Dane	1921–1922
BRO. GERVAIS	Panamanian	1912
BRO. CELESTINE	Panamanian	1912
STEVEN, F. L.	American	1924
MACBRIDE, J.	American	1918
ROSE, J.	American	1918
MAXON, W.	American	1911; 1923
HITCHCOCK, A. A.	American	1911
KILLIP, E. P.	American	1917–1918; 1922
PIPER, C. V.	American	1923
GOLDMAN, F. A.	American	189?–19??
CHRISTOPHERSEN, E.	Norwegian	19??

in judgement, although the lack of money for field work and the pressure of his academic responsibilities have to be considered. As we shall see in the third and last phase, the numbers of novelties being described from Panama, especially in the last decade, e.g., in the Ericaceae, Araceae, Rubiaceae, strongly support such criticism (Table 3).

In 1949 Ivan Johnston's The Botany of San Jose Island was an outstanding contribution, based essentially on a study of his own collections and those of C. O. Erlanson and J. Harlow. In this period the collections of George P. Cooper and George Slater amounted to about 450 numbers from the little explored province of Bocas del Toro, the higher reaches of which remain little explored today.

In 1958, in my opinion, the field trip of William Stern and Kenton Chambers, both then faculty members at the Yale School of Forestry, initiated the third stage of plant collecting in the isthmus, reöpening the door of Panama as a land

TABLE 3. Families published in *Flora of Panama* (1970–1980) and the numbers of new or recently described species.

Year	Number of Families	Total Species	Percentage New or Recently Described Species
1970	5	91	1
1975	11	413	12.5
1976	9	207	10
1978	8	217	32
1980	1	415	23

of promise for the systematics of flowering plants and ferns (Standley & Stern, 1960). The following year, Stern, Chambers, John Ebinger, and I collected more than 1,200 numbers, principally in Darien. In 1960, Duke University, under the auspices of the U.S. Army Research Office, initiated a decade of collecting in Panama. In 1963 Dr. Edwin Tyson, then of Florida State University, shifted much of his research in zoology to the systematics of the angiosperms. His collections, amounting to 5,000 numbers, were housed in the U.S. Army Tropic Test Center, Canal Zone (Dwyer, 1967), which later became Summit Herbarium (Croat, 1971).

Soon after Woodson died in 1963, Walter H. Lewis became Director of the Herbarium of the Missouri Botanical Garden. He immediately set to work getting grant support for botanical exploration in Panama. Table 4 shows that in 1966 and 1967 13 Garden staff members and students made collecting trips in Panama. At about this time Robert L. Dressler became resident botanist with the Smithsonian Tropical Research Institute, at first living on Barro Colorado Island. His own collections and personal studies, particularly on orchids, coupled with his willingness to assist all of those botanizing in Panama, has been of inestimable value over the past 17 years.

One of those profiting from the grant support generated by Walter Lewis was Thomas B. Croat. His accomplishments in collecting during the past 14 years in Panama defy description. Statistics indicate (Table 1) that he tripled the number of plants collected by Paul Standley. Croat's total from the isthmus is more than 23,000 numbers. (See Croat, 1978.)

A glance at Table 1, which shows those who collected more than 3,000 numbers in Panama, is revealing. With the exception of Walter Lewis, this list scores

TABLE 4. Collectors who accompanied Walter Lewis on field trips to Panama (1966–1969). * Indicates individual was staff member of or student at Missouri Botanical Garden.

*Baker, K.	Escobar, N.
*Blackwell, W.	*Hawker, J.
*Burch, D.	Little, C. O.
Correa A., M.	*Macbryde, B.
*Croat, T.	*Oliver, R.
*Crosby, M.	*Robertson, K.
Dressler, R.	*Robyns, A.
Duke, J.	*Verhoek
*Dwyer, J.	Zaborowski, A.
*Elias, T.	

TABLE 5. Resident collectors at Summit Herbarium, Panama.

Antonio, Thomas M.	May 1979–July 1980
Croat, Thomas B.	March 1970–August 1971
	February 1976–September 1976
Folsom, James P.	January 1977–January 1978
Gentry, Alwyn H.	August 1971–October 1972
Hammel, Barry E.	January 1978–May 1979
Kennedy, Helen	September 1972–May 1973
Mori, Scott A.	September 1974–August 1975
Nee, Michael	August 1973–June 1974
Sytsma, Kenneth J.	August 1980–
Witherspoon, John T.	September 1975–November 1975

only those who collected alone. Thus some collectors on the list may also have assisted in team efforts. I have no statistics for the numbers collected by Sydney McDaniel, now in Panama, although they are several thousand.

In 1969, in the Canal Zone, the Missouri Botanical Garden established a field station with a house trailer and a modest herbarium (Croat, 1972). This allows pre-doctoral or post-doctoral students to pursue their research in systematics, as well as to collect. The Garden's resident collectors in Panama, who were also curators of Summit Herbarium, are shown in Table 5.

In 1973 the Missouri Botanical Garden in Panama and the Smithsonian Tropical Research Institute combined their herbarium resources in a restored portion of the former Tivoli Hotel in Balboa, Canal Zone (Croat & Crosby, 1974).

That the Missouri Botanical Garden dominated plant collecting in Panama from the 1940's onward is obvious. However when one considers the extensive collecting done by Edwin Tyson in the 1960's, as well as by Sydney McDaniel and Kurt Blum, sent into Panama originally by Robert Godfrey of Florida State University, as well as the extensive collecting of James Duke over the 1960–1970 decade, under the aegis of the U.S. Army and Battelle Memorial Institute, as well as the eight botanical expeditions of Robert L. Wilbur of Duke University and his students: Frank Almeda, James Luteyn, Richard Weaver, Robin Foster and others, a more fair perspective of collecting in Panama emerges. Wilbur himself has collected some 1,500 numbers in Panama.

Special tribute is due Novencido Escobar and Mireya D. Correa A. of Panama University for building up, over the past decade, the herbarium at Panama University, now numbering over 16,000 sheets.

TABLE 6. Collectors who made largest collections from provinces of Panama.

Bocas Del Toro	von Wedel, H.	3,000
Chiriquí	Croat, T.	3,640
Coclé	Folsom, J.	1,415
Colón	Croat, T.	1,052
Darién	Duke, J.	2,300
Herrera	Folsom, J.	120
Los Santos	Lewis et al.	458
Veraguas	Croat, T.	1,510
San Blas	Duke, J.	500
Canal Zone	Croat, T.	10,737

Today, in Central America, the most exciting country for plant collecting is Panama. Evidence of this is the 15 new species of Rubiaceae which are awaiting description at the Missouri Botanical Garden, these having been encountered since sending off my manuscript of the Rubiaceae of Panama with a total of 415 species at the end of 1979 (Dwyer, 1980). Table 3 shows the numbers of recently described species in parts of the *Flora of Panama*. There are certain areas of Panama, e.g. the Fortuna Dam area, where a single day of intensive collecting will usually yield one or more species of flowering plants new to science. Obviously collectors are penetrating such areas because they and others before them have searched them out, often under great hardship. Also, new roads have been opened in the republic in recent years and local landing strips and helicopter pads have been established in remote areas, often related to industrial or national projects. The collector is aware that pristine collecting grounds of today may fall prey to tomorrow's ax of destruction. Deference is due the Government of Panama for granting collecting permits to qualified collectors. Many institutions reciprocate by forwarding identified duplicate specimens to the Herbarium of the Universidad de Panamá, the national repository.

In conclusion, it is appropriate to pinpoint certain geographical areas of Panama which are "rich and recent" from the viewpoint of botanical collecting, at the same time acknowledging the pioneer efforts of the botanists. Such a listing is never complete. Only those localities botanized in realistic fashion for the first time between 1967 and the present are considered. Certain relatively new collecting areas, e.g. Cerro Jefe (Prov. Panamá from 1965) and Cerro Pirré (Prov. Darién from 1960) have not been included as their "discovery" predated 1967. Table 6 indicates how the various provinces of Panama have benefited from the attentions of different collectors.

1967—James Duke and Joseph Kirkbride, Jr. botanized from Chiriquí Grande (Prov. Bocas del Toro) to Caldera (Prov. Chiriquí).

1967—Walter Lewis, Thomas Croat, and Jon Hawker made important collections at Río Concepción (Prov. Veraguas). In the same year Will Blackwell and Mireya Correa A. made important collections at Santa Catalina.

1971—Thomas Croat collected from Guasimo (Prov. Colón) to Miguel de la Borda (Prov. Colón), using a canoe.

1973—Thomas Croat, Ronald Liesner and Philip Busey botanized in the tropical wet forest on the Burica Peninsula at Bartolo Limite–Rabo de Puerco area (Prov. Chiriquí), utilizing a vehicle. Today the road is overgrown.

1978—Robert Dressler pioneered in collecting from La Pintada (Prov. Coclé) to Coclecito (Prov. Coclé).

1975—Scott Mori was the first to collect at Cerro Colorado (Prov. Chiriquí), close to the Continental Divide, at an elevation of 1,200–1,500 m. Cerro Colorado is the site of a copper mine, easily accessible by road. Mori, together with Alwyn Gentry, explored botanically the summit of Cerro Tacacaruna, elev. 1,975 m, on the Panama-Colombia border.

1976—Thomas Croat collected in the Azuero Peninsula walking for 6 hours to the headwaters of the Río Pedregal (Prov. Los Santos) from Jobero in the same province, southwest of Tonosi.

1977—James Folsom began an era of rewarding collecting on the divide above El Cope (Prov. Coclé).

1978—Barry Hammel collected at two important sites: at Cerro Bruja (Prov. Colón) and the headwaters of the Río Indio and Río Boqueron (Prov. Panamá); from Gualaca (Prov. Chiriquî) to the Fortuna Dam site, proceeding to Cerro Hornito (Prov. Chiriquî).

1979—Barry Hammel collected at Cerro Pate Macho (Prov. Chiriquí, the Río Culebra (Prov. Chiriquî), as well as along the Río Concepción (Prov. Veraguas, especially at a one-man operated gold mine).

There is, of course, a limit to the number of species in Panama, as well as choice collecting sites. It is strange, however, that despite almost 300 years of collecting, the yield of novelties in our day is so great. Since the opening of the Panama Canal in 1914, more endemics have been described from the isthmus than between 1700 and 1913. The richness of the flora is a reflection of the soil and climate of this great tropical country. It is no less a tribute to the efforts of the botanists who have been so richly rewarded.

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RESEARCH, TROPICAL ECOLOGY AND THE FUTURE OF PANAMA[1]

PETER H. RAVEN[2]

Me es muy grato estar presente esta noche para celebrar la feliz conclusión de la *Flora de Panamá*, una obra que ha ocupado la atención de científicos de varias instituciones por casi cuatro décadas. Iniciada por el Jardín Botánico de Missouri, la *Flora de Panamá* surgió de una larga y fructífera colaboración entre los científicos de la República de Panamá, de los Estados Unidos de Norteamérica, así como de otros paises, y esperamos sinceramente que esta obra servirá para estimular un creciente interés y comprensión de las plantas de este hermoso país. La privilegiada posición geográfica de Panamá, uniendo América del Sur con América del Norte, y bañada tanto por el Atlántico como por el Pacífico, ha producido tal profusión y variedad de plantas, que Panamá reúne por sí sola tantas especies de plantas que todo el continente de Europa, un área doscientos veces más grande.

Las ponencias que hemos escuchado en este interesante simposio, tan hábilmente organizado por la Doctora Mireya Correa de la Universidad de Panamá y por el Doctor William D'Arcy del Jardín Botánico de Missouri, dan fé de la gran riqueza biológica de Panamá. Estas ponencias servirán de base para un nuevo libro sobre la historia natural del país, que se editará para celebrar la finalización de la *Flora*, y con miras a contribuir al aprecio y al uso racional de los recursos naturales del país.

Panamá está en condiciones especiales para hacer grandes aportes a la biología y agricultura tropical. Tiene una ubicación geográfica única e instituciones bien conocidas tanto nacional como internacionalmente. Por un lado, el futuro bienestar de sus ciudadanos dependerá en gran parte del uso inteligente de las informaciones disponibles acerca de los recursos naturales del país. Por otra parte, estas mismas instituciones, distinguidas tanto en ciencias básicas como aplicadas, pueden jugar un papel clave en el desarrollo de conocimientos para el beneficio de los seres humanos de toda la faja tropical del mundo.

Unas cuantas estadísticas ayudarán a demostrar cuán importantes serán estos conocimientos. Hace un siglo, los bosques tropicales húmedos ocupaban una superficie mucho mayor que Estados Unidos, México, y América Central juntos. Desde entonces, más de la mitad de estos bosques han sido talados o alterados, y con el actual ritmo de conversión, los bosques estarán totalmente destruidos dentro de treintiún años. Por supuesto que el ritmo de destrucción es irregular, pero se calcula que en la mayor parte de la zona tropical, no quedarán áreas significativas de bosques húmedos tropicales dentro de veinte años. Para entonces, las dos terceras partes de la población mundial estará viviendo en zonas tropicales. Esta destrucción de bosques conducirá a una extinción masiva de animales y plantas, muchos de los cuales no pueden reproducirse fuera de los bosques primarios.

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ANN. MISSOURI BOT. GARD. 67: xvi–xxii. 1980.

Estas transformaciones de bosques, equivalentes a la desaparición, cada *dos* años, de un área de bosque natural del tamaño de toda la América Central, son la consecuencia del desarrollo de los recursos naturales para el aprovechamiento humano. Si fuese verdad que de estas transformaciones resultase un beneficio humano continuo, éstas serían bienvenidas; sin embargo, para una gran parte del trópico, sobre todo para las zonas actualmente ocupadas por los bosques húmedos tropicales, éste *no* es el caso. Nuestros conocimientos actuales simplemente no alcanzan sino para utilizar una porción mínima de estos suelos para la producción agrícola a largo plazo, y de esta manera, hay que considerar a los bosques y suelos como recursos naturales *NO* renovables. Así, nuestro gran desafío como científicos e investigadores en el trópico será el de *aplicar* nuestros conocimientos en el campo práctico para diseñar sistemas agrícolas y agroforestales a largo plazo, mientras luchamos por *concentrar* los sistemas más productivos en las tierras más idóneas. Si logramos acelerar el inventario de la flora y fauna tropical a la vez que adelantamos estudios intensivos de ecosistemas críticos, podremos unir la información necesaria para obtener soluciones prácticas, y ofrecer alternativas a las presiones y necesidades urgentes e inaplazables de una población creciente.

La tecnología de las zonas templadas, basada en milenios de experiencia de agricultura contínua, *no se puede* aplicar a la mayoría del trópico; *poco* se hace actualmente para proveer la información tan indispensable para las zonas tropicales. Mientras tanto, la transformación de tierras para usos a corto plazo las hace inútiles para el futuro. De esto comentaré más adelante. Sin embargo, es precisamente en este área que Panamá puede aportar una contribución insustituible al bienestar humano y a su propia prosperidad.

Resumiendo, tenemos por delante una tarea difícil: la de armonizar el desarrollo económico y social de una población en aumento, con la preservación, aunque sea parcial, de un mundo biológico que todavía nos oculta sus mayores riquezas.

Panama, where the former island continent of South America was joined to North America about 3.1 million years ago (Keigwin, 1978; Marshall et al., 1979), is biologically one of the most critical and fascinating areas of the world's tropics. The plants and animals of South America, isolated for more than 100 million years, had an ultimate common origin with those of Africa. As South America converged on North America through the 65 million years of the Tertiary Period, its tropical biota, dispersed across the ever-narrower sea, invaded North America in greater and greater numbers. Panama, which has been occupied primarily by open savanna-type vegetation for much of the past three million years, provided the keystone linkage. For this reason, and because of its geographical situation, its 50,000 square kilometers are occupied by the richest and most diverse assemblage of plants and animals of any area of comparable size.

I have already mentioned that Panama has nearly as many kinds of flowering plants as all of Europe; it may also be pointed out that it has, in just over 52,000 km^2, about a third as many species of flowering plants as all of tropical Africa (30,000 species), an area of 20 million square kilometers (Brenan, 1978)! Comparable figures could be provided for most groups of animals that are well enough

known to allow such calculations. They illustrate clearly that even by tropical standards Panama is exceptionally rich biologically. It is in fact this rich diversity of the plants and animals of Panama that is so properly a source of national pride, and the reason we have all gathered here for this most enjoyable symposium.

Adding to its special interest, Panama was the area where the last direct connection between the marine biota of the Atlantic and Pacific existed, and the area where this connection was finally severed three million years ago. As a result, Atlantic and Pacific marine plants and animals not only exist in close proximity, but they exist in such a way that three million years of divergence between the derivatives of some formerly continuous populations can be timed accurately—a natural evolutionary experiment without parallel.

For these and many other reasons, biologists historically have found Panama an exciting and interesting place in which to carry out their studies. Institutions such as the Universidad de Panamá, the Gorgas Memorial Laboratory, and the Smithsonian Tropical Research Institute (STRI) have made significant contributions to our knowledge of the biota of the Republic and their significance for man. A continued dedication to the importance of broadening this knowledge and utilizing it wisely in development has been signaled in recent years by the establishment of RENARE,[3] by the biological and ecological studies carried out under the auspices of IRHE,[4] and by the special position accorded to STRI under the terms of the Canal Treaty.

The Government of Panama has explicitly recognized the principles of conservation and wise management of land as the basis for sustainable development by the formation of RENARE, in which conservation and development are linked for the benefit of all the people of the Republic. Among the more notable recent accomplishments have been the active efforts to protect the watershed of the Canal, including both the projected reforestation schemes and the establishment by President Royo of the adjacent 24,000-hectare Parque Nacional la Libertad; the establishment of Barro Colorado Island as a nature monument and its scheduled enlargement in 1999 at the conclusion of the treaty period; the plans for national parks in Darién along the Colombian border, along the Costa Rican border, and surrounding Volcán Barú, the highest mountain in the Republic, in the western highlands; the consistent efforts by IRHE and other agencies to conduct meaningful biological and ecological inventories before carrying out large-scale public works; and the educational components included in many of these efforts.

Notwithstanding the great biological interest in the natural resources of Panama, the government's clear realization that the prosperity of the people rests upon the wise utilization of these resources, and the current implementation of many outstanding efforts to realize the consequences of this relationship, very serious problems face the Republic. These problems are, for the most part, shared with the other countries of the tropics, where, as already pointed out, some two-thirds of the world's population will be living by the end of the 20th century.

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[3] RENARE: Dirección Nacional de Recursos Naturales Renovables.
[4] IRHE: Instituto de Recursos Hidro-Eléctricos.

Although the populations of most tropical countries are growing very rapidly—many at a rate at which they will have doubled by early in the next century—population is by no means the only factor involved in the worldwide ecological crisis facing not only Panama but every other tropical country in the world. Panama itself provides a graphic illustration of this relationship. With just under two million people in some 50,000 square kilometers, Panama may be compared not only with the Netherlands, with some 14 million people inhabiting 41,000 square kilometers, but also with Java, which has some 90 million people living in an area only about two-and-a-half times the size of Panama (129,500 km^2). The annual increase in the population of Java is nearly as great as the entire population of Panama! Granted that there are more extensive areas of relatively fertile soil in Java than in Panama, a comparison between the two regions, both located near the equator, illustrates graphically the way in which different patterns of land-use can affect population density. It also must be recognized that the relatively small population of Panama has already destroyed more than half of the original forest resources, and may, unless alternatives fostered by the Government prove effective, make short work of the rest.

In Java, the heavy utilization of naturally moist or irrigated rice-lands located on relatively fertile soils is an important element in the nutrition of the people. In addition, the homestead gardens of the rural people in Java provide a rich source of diverse foods, many of them derived from the native forests. Protein is largely provided by fish, some cultured, chickens, goats, and, in non-Moslem areas, by swine. In contrast, land use in Panama, particularly in the long-occupied and once relatively fertile deciduous-forest lands of the Azuero Peninsula, as Stanley Heckadon has emphasized earlier in this symposium, is based on "roza" grain agriculture followed by cattle pasture. These uses are highly destructive of the fertility of the soil when the density of people practicing them becomes too great, and large numbers of *santeños* (from Los Santos Province, on the Azuero Peninsula) are now emigrating to other areas, with potentially serious consequences to which we shall turn our attention later.

Panama is in the fortunate situation of being able to derive much of its income from world trade, but, despite this, the wise use of natural resources is still of basic importance for the country. There is much to be said for regional and local self-sufficiency in a world in which the current energy crisis is just the first symptom of worldwide shortage of raw materials of all kinds that fuels inflation everywhere. No one can guarantee the continued operation of the world economic system under growing pressures of this magnitude, and if Panama is to feed, clothe, and shelter twice as many people early in the next century at least as well as is possible now, or actually to better their lot, the country will need to make extremely wise and forward-looking decisions about the proper utilization of its resources now.

These decisions ideally should be made against a background of continued attention to slowing the rate of population growth as much as possible. This will be extremely difficult at first, with about 43 percent of the population under 15 years of age, but the individual prosperity of fewer people utilizing an identical set of resources in the future will obviously be greater than otherwise. For this reason, the continuing efforts of the Government to decelerate the rate of growth

of Panama's population appear to be well justified, despite the apparent paradox of the *relatively* low population level as compared with those of other areas.

The principal elements necessary for improving the lot of the Panamanian people are the same as those necessary throughout the tropics of the world. They are all related to the search for finding ways to implement agricultural, forestry, or other kinds of systems that will sustain human life on areas now occupied with different kinds of natural vegetation, on a diverse array of tropical soils. The most direct reason that the population density (40 people per km^2) of Panama cannot, with the application of present technology, equal that of the Netherlands (340 per km^2), where the per capita gross national product is nearly six times as high as it is in Panama, is that we simply do not know how to utilize most soils of Panama, or most other tropical soils, in as productive a way as is possible in many temporate regions.

National schemes have not governed the patterns of land use in Latin America in the past, any more than they have governed the patterns of land use in other regions of the world. What is a problem, however, is that when forest is cleared in most temperate regions, or prairies are plowed, the resulting fields are productive and, with proper management, remain so indefinitely. The kinds of agriculture that function well in temperate regions, however, cannot be transferred wholesale to the tropics, and it is our collective tragedy that we are just starting to act upon the consequences of this fact. The current estimate of Brazilian officials is that no more than 0.3 percent of the Amazon forest can be put into sustainable agriculture, and although the soils of Panama are generally better, the sad truth is that no one really knows how to manage most of those now occupied by moist forest for sustained yield once they are cleared. There is virtually no tropical deciduous forest left in Panama today, and the agricultural practices which have ruined the fertility of this potentially more productive region are now being transferred to the humid lowland forests of the Darién and of Bocas del Toro on the western part of the Caribbean slope, where they will produce food for only a year or two, instead of a decade or two. There is urgency in attempting to restore the fertility and productivity of the ravaged Azuero Peninsula, but technology known at present will not allow the sustained cultivation of the Darién or the Caribbean forests. Where, then, are the hungry santeños to turn?

The moist forests that still persist in the northwestern and eastern portions of the Republic are inhabited by the richest and most diverse array of plants and animals of the entire Central American region. Some of them might be useful directly as sources of human food, shelter, energy, medicine, or for other purposes, but the only hope of discovering the extent to which this may be true will be to survey these forests biologically as rapidly as possible and to concentrate in the course of these studies on groups of organisms of known or suspected economic importance. In addition, as much as possible should be learned about the functioning of the undisturbed forest that exists in these regions, because only such knowledge offers hope of utilizing them on a sustainable basis or modifying them into some other form from which useful products could be derived. Meanwhile, because these forests cannot, by and large, be put into sustainable agricultural use with currently available technology, the forests should be conserved to the greatest extent possible while we are gaining knowledge, and the modifi-

cations that are allowed meanwhile should be as limited as possible in order to help secure the future prosperity of the country. These deceptively rich and productive-looking forests are simply not a suitable locale for most kinds of development, and such development can, in most cases, lead only to their total depletion, often with severe economic loss to those responsible.

For reasons just outlined, both the citizens of Panama and those who live elsewhere have genuine reason to applaud the establishment of the Darién Frontier National Park and the strategic plans that are being developed for the proper management of this area under the guidance and supervision of RENARE. The coöperation between Panama and Colombia that has made possible the progress to date has also been evident in the development of the 200,000 hectare Parque de la Amistad on the Cordillera de Talamanca between Panama and Costa Rica. Of equal importance are the efforts to reforest large denuded sections of the Panama Canal, and for the management of the Volcán Barú park, including the integral management of the Rio Caldera watershed.

Commendable as these schemes for preservation and restoration of natural resources are, however, the real problem facing Panama is how to guarantee people an adequate diet without wrecking the natural resources of the country completely—in other words, how to utilize the land on a sustainable basis, and to make the connotation of the word "renovable" in RENARE meaningful. These are global themes, and they have been stated with exceptional clarity and force in the World Conservation Strategy, promulgated by the International Union for the Conservation of Nature and Natural Resources (IUCN) in early March of this year. Throughout the tropics of the world, both multinational corporations, which presumably have a choice, and the peasant poor, who for the most part do not, are rapidly destroying the productive ecological systems on which human livelihood depends, without the creation of viable alternatives. The solution, both for Panama and throughout the tropics, depends upon a reversal of the forces that are destroying these ecological systems. Some of the elements that might be involved include the following:

Afforestation schemes for the protection of watersheds, such as those that are currently being conducted by RENARE in the watershed of the Canal and elsewhere, and by IRHE around the Bayano Dam, are of special importance. The establishment of forest plantations and of areas devoted to agro-forestry, coupled with soil conservation measures and the improvement of pastures on areas that can sustain cattle grazing, all have immediate desirable consequences, among them the provision of employment for rural populations. National policy can help to prevent the institutional squandering of the national patrimony of forest resources for short-term gain, but only the provision of employment and the ability to feed their children properly can divert the santeños from the moist forests of the northwest and east, where they can cut off the trees and grow a crop or two before the soils are depleted.

Panama will be well served by learning as much as possible about its existing natural resources and by applying the information gained as directly as possible to their sustainable utilization. In this process, the traditional national institutions such as the universities have a vital role to play, and they should be funded in such a way that they can make the contribution of which they are capable, at the

same time that new institutions are established. Meanwhile, the land should be developed as wisely as possible, with highly productive modes of agriculture concentrated in areas, such as perhaps portions of Chiriquí Province, where they can be carried out on a sustainable basis. Large-scale irrigation schemes should be developed elsewhere in appropriate areas to further the concentration of productive agriculture. Much more attention needs to be paid in Panama and everywhere else in the tropics to the improvement of the lot of rural agriculturists, and information needs to be brought as efficiently from other areas of the world with similar climates to be used locally. For example, *Brosimum alicastrum* is a tree crop well known in southern Mexico as a highly productive source of flour that can be grown in many forest soils. Might it not be just as suitable for cultivation in portions of Panama?

There is a worldwide crisis that threatens all portions of the tropics. During the course of the next generation, a majority of all undisturbed tropical forest will be modified for human use, and hundreds of thousands of species of plants and animals will become extinct. Only the prompt accumulation of knowledge and its direct application to human welfare will help to ameliorate the situation; the traditional *laissez-faire* outlook on the operation of multinational concerns and neglect of the welfare of rural farmers that characterize all too many tropical countries will only serve to make the situation worse.

In this situation, it seems possible that Panama, a country blessed with abundant and diverse kinds of plants and animals, relatively fertile soils, a varied topography, the presence of several significant international institutions, the worldwide interest of ecologists and other biologists, a well conceived governmental program that links conservation and the wise use of natural resources with development according to ecologically sound principles, and an impressive array of resident scientists and of national institutions, will be able to make a significant contribution. If Panama can continue to expand and to accelerate its efforts at intelligent self-development, this small country, located at the crossroads of North and South America, of the tropical Atlantic and Pacific, and forming one of the most intense zones of contact between Hispanic and Anglo-American culture, has the potentiality of contributing in a significant way to the destiny of other countries throughout the tropics of the world. We who have come here to celebrate the completion of the *Flora of Panama* pledge ourselves to help as much as we can in striving to attain that transcendently important goal.

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CONTRIBUTORS TO THE *FLORA OF PANAMA*

The over one-hundred contributors to families or parts of families to the *Flora of Panama* are listed below, together with their institutional affiliation when the contribution was published. When multiple authors are listed, the institution is always that of the first: the institution of the other will be found in a listing at the second author's name. Some authors published from two institutions, and an asterisk (*) is used to indicate those families published while at the second address.—W. G. D'ARCY

ALLEN, C. K. Missouri Botanical Garden.	Lauraceae.
ALLEN, P. H. Missouri Botanical Garden.	Orchidaceae (part).
AMSHOFF, G. J. H. State University of Utrecht.	Myrtaceae.
AUSTIN, DANIEL F. Missouri Botanical Garden. Florida Atlantic University.*	Convolvulaceae*; Polemoniaceae; Trigoniaceae.
BAILEY, L. H. Cornell University.	Palmae [Palmaceae]; Rosaceae: *Rubus*.
BARKLEY, T. M. Kansas State University.	Compositae: Senecioneae.
BLACKWELL, WILL H., JR.	Loganiaceae; Sapotaceae.
——— & DODSON. Missouri Botanical Garden.	Anacardiaceae.
BURCH, DEREK & WEBSTER. Missouri Botanical Garden.	Euphorbiaceae.
BURGER, W. C. Missouri Botanical Garden.	Moraceae: *Sorocea*.
BUSEY, PHILIP. University of Florida Agricultural Research Center, Ft. Lauderdale.	Compositae: Elephantopidinae.
CANNE, JUDITH M. University of Guelph, Guelph, Ontario, Canada.	Compositae: Galinsoginae.
CONSTANCE, L. & MATHIAS. University of California, Berkeley.	Umbelliferae.
CORREA, A., M.D. & TAYLOR, B. Universidad de Panamá.	Droseraceae.
CROAT, THOMAS B. Missouri Botanical Garden.	Gnetaceae; Hydrophyllaceae; Sapindaceae; Staphyleaceae.
——— & CUATRECASAS.	Malpighiaceae.
CUATRECASAS, JOSÉ. Smithsonian Institution.	Brunelliaceae; Sterculiaceae: *Theobroma*.
——— & CROAT.	Malpighiaceae.
DANDY, J. E. British Museum (N.H.).	Magnoliaceae; Winteraceae.

TABLE 1. CONTINUED

D'ARCY, W. G. Missouri Botanical Garden.	Basellaceae; Bataceae; Callitrichaceae; Capparaceae—Tovarioideae; Caprifoliaceae; Ceratophyllaceae; Cistaceae; Compositae: Introduction, Anthemideae, Astereae, Coreopsidinae, Heliantheae—introduction, Helianthinae, Inuleae; Guttiferae; Hippocastanaceae; Leguminosae: *Abrus, Calopogonium, Canavalia, Centrosema, Cologania, Cymbosema, Galactia, Mucuna, Pachyrhizus, Pueraria, Stizolobium, Teramnus, Trifolium, Ilex*; Oleaceae; Pedaliaceae; Plantaginaceae; Quiinaceae; Salicaceae; Scrophulariaceae; Solanaceae; Styracaceae; Symplocaceae; Theophrastaceae.
——— & DWYER.	Leguminosae: *Erythrina*.
——— & LACKEY.	Leguminosae: *Macroptilium, Phaseolus, Vigna*.
——— & POSTON.	Leguminosae: *Lablab*.
——— & TOMB.	Compositae: Lactuceae.
——— & SCHANEN.	Erythroxylaceae.
DEN HARTOG, C. Rijksherbarium, Leiden.	Hydrocharitaceae.
DEROON, A. C. State University of Utrecht.	Marcgraviaceae.
DEWOLF, G. D., JR. University of Cambridge, Cambridge.	Moraceae: *Ficus*.
DILLON, MICHAEL O. Field Museum of Natural History.	Leguminosae: *Acosmium, Aeschynomene, Alysicarpus, Ateleia, Chaetocalyx, Dussia, Myroxylon, Ormosia, Zornia*.
DODSON, CALAWAY H. Missouri Botanical Garden.	Anacardiaceae; Coriariaceae.
——— & ROBYNS.	Hippocrateaceae.
DUKE, J. A. Missouri Botanical Garden.	Amaranthaceae; Berbaridaceae; Caryophyllaceae; Ceratophyllaceae; Chenopodiaceae; Monimiaceae; Myristicaceae; Nymphaeaceae; Polygonaceae; Ranunculaceae.
DUNN, DAVID, B. University of Missouri, Columbia.	Leguminosae: *Lupinus*.
DURKEE, L. H. Grinnell College, Grinnell, Iowa.	Acanthaceae.
DWYER, JOHN D. Missouri Botanical Garden.	Leguminoseae: Papilionoideae; Ochnaceae; Rubiaceae.
——— & D'ARCY.	Leguminosae: *Erythrina*.
EDWIN, GABRIEL. Field Museum of Natural History.	Aquifoliaceae.
——— & HOU. Roosevelt University, Chicago.	Celastraceae.
ELIAS, THOMAS S. Missiouri Botanical Garden. The Carey Arboretum, Millbrook, New York.*	Compositae: Vernoniinae*; Menyanthaceae; Cyrillaceae; Balsaminaceae; Vitaceae.
———* & PORTER*.	Rutaceae*.

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———* & ROBYNS*.	Gentianaceae*.
EPLING, CARL C. & NOWICKE. University of California, Los Angeles.	Labiatae.
EXELL, A. W. British Museum (N.H.).	Combretaceae.
FANTZ, PAUL R. North Carolina State University.	Leguminosae: *Clitoria*.
FRIES, R. E. University of Uppsala.	Annonaceae.
GARDNER, ROBERT C. Ohio State University.	Compositae: Cardueae.
GENTRY, ALWYN H. Missouri Botanical Garden.	Bignoniaceae; Buxaceae; Humiriaceae; Rafflesiaceae; Sabiaceae.
GLEASON, H. A. New York Botanical Garden.	Melastomataceae.
GREGORY, D. P. Missouri Botanical Garden.	Rhizophoraceae.
HAYNES, ROBERT R. Ohio State University.	Orobanchaceae.
——— & WENTZ.	Najadaceae; Potemogetonaceae.
HERMANN, F. J. United States Department of Agriculture, Beltsville, Maryland.	Leguminosae: *Lonchocarpus*.
HERRERA-MACBRYDE, OLGA & LEWIS. Missouri Botanical Garden.	Polygalaceae.
HOU, DING & EDWIN. Rijksherbarium, Leiden.	Celastraceae.
HOWARD, R. A. The Arnold Arboretum of Harvard University	Icacinaceae; Polygonaceae: *Coccoloba*.
HUNTER, GORDON E. Murray State College, Murray, Kentucky.	Dilleniaceae.
JONKER, F. P. State University of Utrecht.	Burmanniaceae.
KEIL, DAVID J. Ohio State University.	Compositae: Tageteae.
KILLIP, E. P. Smithsonian Institution.	Amaryllidaceae: *Bomarea*; Urticaceae.
LACKEY, JAMES A. & D'ARCY. Smithsonian Institution.	Leguminosae: *Macroptilium, Phaseolus, Vigna*.
LEWIS, WALTER H. Missouri Botanical Garden.	Dichapetalaceae.
——— & HERRERA-MACBRYDE.	Polygalaceae.
LOURTEIG, ALICIA. Laboratoire de Phanérogamie, Paris.	Oxalidaceae.
LUNDELL, CYRUS LONGWORTH. Texas Research Institute, Renner.	Myrsinaceae.
LUTEYN, JAMES L. & WILBUR. New York Botanical Garden.	Ericaceae.

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MACBRYDE, BRUCE. Missouri Botanical Garden.	Geraniaceae.
MANNING, W. E. Bucknell University.	Juglandaceae.
MATHIAS, M. E. & CONSTANCE. University of California, Los Angeles.	Umbelliferae.
MAXWELL, RICHARD H. Indiana University Southeast, Albany.	Leguminosae: *Dioclea*.
MCCLINTOCK, ELIZABETH. California Academy of Sciences.	Saxifragaceae.
MCLAUGHLIN, LEO & WINDLER. Towson State College, Towson, Maryland.	Leguminosae: *Croatalaria*.
MCVAUGH, R. University of Michigan.	Rosaceae.
MEYER, FREDRICK G. National Arboretum, Washington, D.C.	Valerianaceae.
MOLDENKE, H. N. New York Botanical Garden. 303 Parkside Road, Plainfield, N.J.*	Avicenniaceae*; Eriocaulaceae; Verbenaceae*.
MORTON, C. V. Smithsonian Institution.	Dioscoreaceae; Smilacaceae.
MULLER, C. H. University of California.	Fagaceae.
MUNZ, P. A. Rancho Santa Ana Botanic Garden.	Onagraceae.
NEVLING, L. I., JR. Missouri Botanical Garden.	Aizoaceae; Araliaceae; Balanophoraceae; Chloranthaceae; Corylaceae; Lacistemaceae; Lythraceae; Myricaceae; Olacaceae; Opiliaceae; Portulacaceae; Proteaceae; Ulmaceae.
NOWICKE, JOAN W. Missouri Botanical Garden.	Apocynaceae; Boraginaceae; Rhamnaceae.
——— & EPLING.	Labiatae.
PFEIFER, H. W. Missouri Botanical Garden.	Aristolochiaceae.
PORTER, DUNCAN M. Missouri Botanical Garden.	Burseraceae; Simarubaceae; Zygophyllaceae.
——— & CUATRECASAS. National Science Foundation.	Brunelliaceae.
——— & ELIAS. Virginia Polytechnic Institute, Blacksburg.	Rutaceae.
POSTON, MURIEL E. Howard University, Washington, D.C.	Leguminosae: *Cajanus*, *Flemingia*, *Rhynchosia*.
——— & D'ARCY.	Leguminosae: *Lablab*.
PRANCE, GHILLEAN T. New York Botanical Garden.	Caryocaraceae.
RAEDER, KATHERINE. Missouri Botanical Garden.	Phytolaccaceae.

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RHODES, D. G. Missouri Botanical Garden.	Menispermaceae.
RIZZINI, C. T. Jardim Botanico, Rio de Janeiro.	Loranthaceae.
ROBERTSON, KENNETH R. Missouri Botanical Garden.	Clethraceae.
ROBSON, NORMAN K. B. British Museum (N.H.).	Hypericaceae.
ROBYNS, ANDRÉ. Missouri Botanical Garden.	Bixaceae; Bombacaceae; Cochlospermaceae; Flacourtiaceae; Malvaceae; Sterculiaceae; Theaceae; Tiliaceae; Turneraceae; Violaceae; Vochysiaceae.
——— & ELIAS. Jardin Botanique National de Belgique, Miese.	Gentianaceae.
ROLLINS, R. C. Gray Herbarium.	Cruciferae.
SCHANEN, NOEL & D'ARCY. Missouri Botanical Garden.	Erythroxylaceae.
SCHERY, ROBERT W. Missouri Botanical Garden.	Leguminosae: Caesalpinoideae; Mimosoideae; Pontederiaceae.
——— & SCHUBERT.	Begoniaceae.
SCHUBERT, B. G. The Arnold Arboretum.	Leguminosae: *Desmodium*.
——— & SCHERY.	Begoniaceae.
SIMPSON, BERYL BRINTNALL. Smithsonian Institution.	Compositae: Mutiseae.
SMITH, C. EARLE, JR. Crops Research Division, Agricultural Research Service, U.S.D.A., Beltsville, Maryland.	Elaeocarpaceae; Meliaceae.
SMITH, LYMAN B. Smithsonian Institution.	Bromeliaceae.
SPARRE, BENKT. Swedish Museum of Natural History, Stockholm, Sweden.	Tropaeolaceae.
SPELLMAN, DAVID L. Missouri Botanical Garden.	Asclepiadaceae.
STANDLEY, P. C. Field Museum of Natural History.	Araceae.
STUESSY, TOD F. Ohio State University.	Compositae: Ambrosiinae, Melampodiinae, Ziniinae.
SVENSON, H. K. Brooklyn Botanic Garden.	Cyperaceae.
SWALLEN, J. R. Smithsonian Institution.	Gramineae.
TAYLOR, PETER. Royal Botanic Gardens, Kew.	Lentibulariaceae.
TAYLOR B., A.S. & CORREA. Universidad de Panamá.	Droseraceae.

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TOMB, A. SPENCER & D'ARCY. Kansas State University.	Compositae: Lactuceae.
VAN ROYEN, P. Rijksherbarium, Leiden.	Podostemonaceae.
VERHOEK-WILLIAMS, SUSAN. Missouri Botanical Garden.	Plumbaginaceae; Primulaceae.
VIVALDI, JOSÉ L. Universidad de Puerto Rico.	Malpighiaceae: *Malpighia*.
WEBSTER, GRADY L. & BURCH. University of California, Davis.	Euphorbiaceae.
WENTZ, W. ALAN & HAYNES. Ohio State University.	Najadaceae; Potemogetonaceae.
WHITE, F. University of Oxford, Oxford, England.	Ebenaceae.
WHITE, PETER S. Uplands Field Laboratory, Great Smoky Mts. National Park, Gatlinberg, Tennessee.	Leguminosae: *Barbiera, Cracca, Dalea, Diphysa, Gliricidia, Indigofera, Lennaea, Sesbania, Sophora, Stylosanthes, Tephrosia, Willardia*.
WILBUR, ROBERT L. Duke University, Durham, N.C.	Campanulaceae.
——— & LUTEYN.	Ericaceae.
WILLIAMS, L. O. Harvard University.	Orchidaceae (part).
WINDLER, DONALD R. & MCLAUGHLIN. Towson State College, Towson, Maryland.	Leguminosae: *Crotalaria*.
WOODSON, R. E., JR. Missouri Botanical Garden.	Alismataceae [Alismaceae]; Amaryllidaceae; Bataceae [Batidaceae]; Butomaceae; Cactaceae; Cannaceae; Capparaceae [Capparidaceae]; Caricaceae; Commelinaceae; Connaraceae; Cornaceae; Crassulaceae; Cunoniaceae; Cycadaceae; Cyclanthaceae; Haemodoraceae; Haloragaceae [Haloragidaceae]; Hernandiaceae; Iridaceae; Juncaceae; Lecythidaceae; Lemnaceae; Liliaceae; Loasaceae; Maranthaceae; Mayacaceae; Moraceae; Moringaceae; Musaceae; Nyctaginaceae; Papaveraceae; Passifloraceae; Potamogetonaceae; Rapateaceae; Resedaceae; Salicaceae; Taxaceae; Thymelaeaceae; Tovariaceae; Triuridaceae; Typhaceae; Velloziaceae; Xyridaceae; Zingiberaceae.
YUNKER, T. G. De Pauw University.	Piperaceae.
WUNDERLIN, RICHARD P. University of South Florida.	Cucurbitaceae.

INDEXES TO THE FAMILIES IN THE *FLORA OF PANAMA*

The *Flora* was divided into numbered parts using Roman numerals. The systematic treatment of the families is complete as Parts II–IX and indexes follow. Part I is not missing: it will be used to publish "general discussions of historical, geographical, physiographic, and floristic relations" and other information pertaining to the *Flora of Panama,* as outlined in Woodson's broadside (see pg. ii).

Early in the *Flora* program, families known or thought to occur in Panama were assigned a sequential series of numbers, "following generally the system of Engler and Prantl." These are the Arabic numbers preceding each family name in the Systematic Index. A few families were found to occur in Panama as the project progressed, and they were assigned numbers and letters within the original sequence. Other families thought to occur in Panama have not been found there, but notes to this effect were published in the *Flora* series for completeness. Family names in the Systematic Index are followed by the volume(s), pages, and year(s) of the ANNALS in which they appeared.

Family names in the Alphabetical Index are followed by the volume number(s), pages, and year of the volume(s) of the ANNALS in which they appeared. Numbers in parentheses are the *Flora of Panama* part numbers (Roman numerals) and systematic family numbers (Arabic numerals) assigned to each family.
—M. R. Crosby

ANN. MISSOURI BOT. GARD. 67: xxix–xxxiii. 1980.

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